AMERICAN MACHINIST

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Friction Drum for Steam Oyster Dredges.

Some of the advantages of this drum are, that, instead of the clutch being "all on" or "all off" as in others used for the same purpose, it is entirely responsive to the pressure of the operating lever, the operator *feeling* at all times how much power he is applying and increasing or decreasing at will, always having it under such control as not to endanger the dredge, the cable or any of the mechanism; also the drum is so constructed that adjustment can be made for any desired maximum pull; when so adjusted, if the load or strain is at any time exceeded, the clutch will automatically relieve itself by slipping, so that the pull on the cable and mechanism will never be more than that for which the adjustment is made. By this means the sudden and severe—often destructive—strains liable to occur from the fouling of the dredge with the bottom are obviated.

A further advantage of this drum is that it does not require to be stopped and re-adjusted to raise an increased load, its lifting power being directly proportionate to the force applied to the lever, so that to lift an unusual load, all that is required is to apply greater pressure to the operating lever. These advantages make the drum entirely under the control of the operator, capable of developing sufficient power for all purposes both ordinary and extraordinary, and constitute a safety device by which the winding mechanism is protected against injury or derangement.

The friction in this machine is produced by a series of flat disks or plates of sheet-iron, by increasing the number of which the frictional surface can be indefinitely increased, thus obtaining any desired amount of wearing surface, while at the same time the friction disks, which receive all the wear, are easily and cheaply replaced when worn out.

Fig. 1 represents the simplest form of oyster winch, and shows a single drum ready for use. The drum or barrel is loose on the shaft. The shaft is coupled to the drum, when desired, by the friction clutch contained in the left hand flange; this is operated by the collar *A* on the shaft in any convenient manner. Ordinarily a forked lever is employed, brought into convenient reach of the operator. When desirable a rope or cord may be attached to the outer end of the lever, permitting the controlling of the friction at any distant point.

A double-acting strap-brake surrounds the flange of the barrel controlled by the lever *B*. This lever may be operated directly, or by means of a cord, as most convenient. The strap-brake is counter-weighted so that it is normally out of engagement, and the barrel free to revolve. The friction clutch may now be thrown in and the load hoisted to the desired point, then by applying the brake and disengaging the clutch the load will be held by the brake. Lowering is effected by releasing the pressure of the brake, permitting the load to run out.

By means of four set-screws, not shown in the engraving, the adjustment of the clutch can be readily made to any desired point of release, so that when the strain upon the barrel reaches the desired limit the clutch will slip, permitting the rope to pay out. As soon as the strain on the rope falls below the slipping point, the clutch will again act, causing the drum to revolve with the shaft.

Fig. 2, page 2, is an outline illustration of two drums, each similar to the one shown by Fig. 1, both mounted upon and driven by the same shaft. Each drum is entirely independent of the other, so that they may be operated either separately or together, and also in either direction, so that one may be hauling in while the other is paying out. Where the space admits of it, this arrangement may be improved by providing an additional bearing for the shaft between the two drums.

The arrangement shown in Fig. 3 enables the two drums to be located opposite each other, athwartships, and places them in the most favorable position for the ropes to lead off overboard. The shafts and other parts can thus be much lighter than where the whole strain of both drums comes on one long shaft, the lubrication is better, and the convenience, for cleaning and repairs, is greater.

These drums are simple in their arrangement, and thoroughly well made. The manufacturers are the Yale & Towne Mfg. Co., Stamford, Conn.

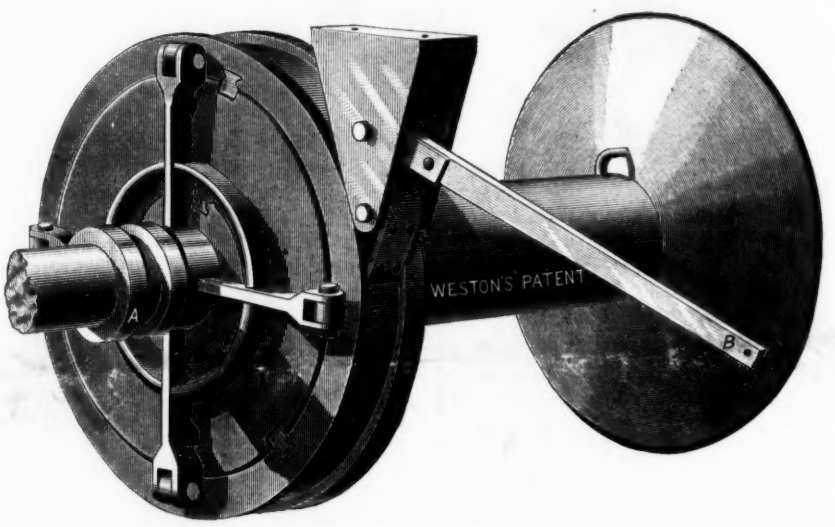


FIG. 1.—FRICTION DRUM.

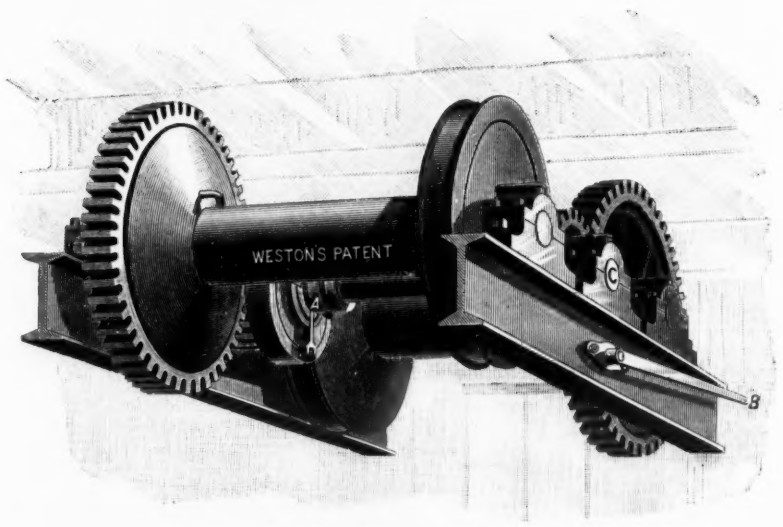


FIG. 3.—FRICTION DRUMS.

Fig. 3 shows another arrangement of two drums. As in the preceding case, each drum can be entirely disconnected from the driving shaft and is free to revolve independently. Between the two drums is a third shaft *C*, which is to be connected in any desired manner, either directly or by gearing, with the engine. On this middle shaft are two pinions gearing into the spur-wheels on the drums. Within these pinions are the disk-clutches, by means of which the pinions can be connected or disconnected from the driving shaft at will. Each of the drums is provided at one end with a strap-brake, operated by a lever, as shown at *B*, the whole arrangement being substantially the same in action as in the case of Fig. 2, wherein the drums are placed upon one shaft.

At one of the early meetings of the American Society of Mechanical Engineers, Mr. Coleman Sellers read a remarkably able and instructive paper on the introduction of the metric system into machine shops, showing conclusively the disadvantages of that system. This paper has recently been read before the Leeds (England) Association of Foremen Engineers and Draftsmen, where it was most favorably received.

Observation in England shows that since the advent of the electric light, the consumption of gas has materially increased. This is partly accounted for by the demand for a better light, and partly by the fact that gas engines are extensively used for electric-light purposes.

Early Engineering Reminiscences.

BY GEORGE ESCOL SELLERS.

SEVENTEENTH PAPER.

Early in August, 1835, when our first engine was about ready to be placed on the road, Mr. Cameron, accompanied by Mr. Brandt, came to our works to inspect it. Mr. Cameron brought with him drawings of an attachment invented and patented by Mr. E. L. Miller of the Charleston and Hamburg R. R. of S. C., by which a part of the weight of the tender could be thrown on the driving-wheels when an increased adhesion was required, directing us to put it on our engine, they paying the additional expense as well as for the patent right.

Anticipating this, or rather doubting the traction of the drivers, as placed back of the fire-box, being equal to the steam-power, I had devised and applied a lever arrangement, the fulcrum of which was the axle of the driving-wheels. The attachment of the tender to the engine was so made that at all times when drawing a train a portion of the weight of the front of the engine was removed from the truck and thrown on the driving-wheels; this increased with the draft in ascending grades, as additional traction was required, being automatic in its action. This device was approved of and applied to our early engines, as was the Miller arrangement to the Baldwin engines, until the better distribution of weight on two pair of drivers was adopted.

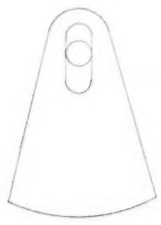
About this time we had a visit from Mr. Rogers, the founder of the Rogers Locomotive Works, of Paterson, N. J. He was accompanied by Mr. Danforth of the same place. Our business connection with Mr. Rogers was of long standing, having furnished him with card-clothing for cotton machinery. As he expressed a desire to visit our works, I drove him and his friend out to them. The locomotive then in the hands of the painter preparative for delivery, seemed to be the chief attraction, particularly the iron frame, outside connections, and the driving-wheels. The arrangement for securing counter-weights was commented on by Mr. Rogers, he asking why they were not cast solid with the wheel? During this visit Mr. Rogers said his friends J. B. Jarvis and Horatio Allen had long been urging him to try his hand at locomotive building, and that he had serious thoughts of doing so. I have related this as evidence that counterbalancing was not only under discussion but in actual course of experiment prior to Mr. Rogers commencing locomotive building.

As I was at that time residing at the works, I did not return to the city with these gentlemen, but in the evening sent them with a trusty and intelligent driver, who on his return seemed to have been much amused at the conversation between Mr. Rogers and his friend; he said they both spoke in praise of the character of the workmanship on the engine; that Mr. Rogers had remarked that he had noticed a strong, broad-wheel truck that he supposed was intended to move the locomotive over the country roads to the railroad. He had also noticed that the engine was set up opposite the widest door in a substantial stone building; he had measured the doorway, and the engine across the

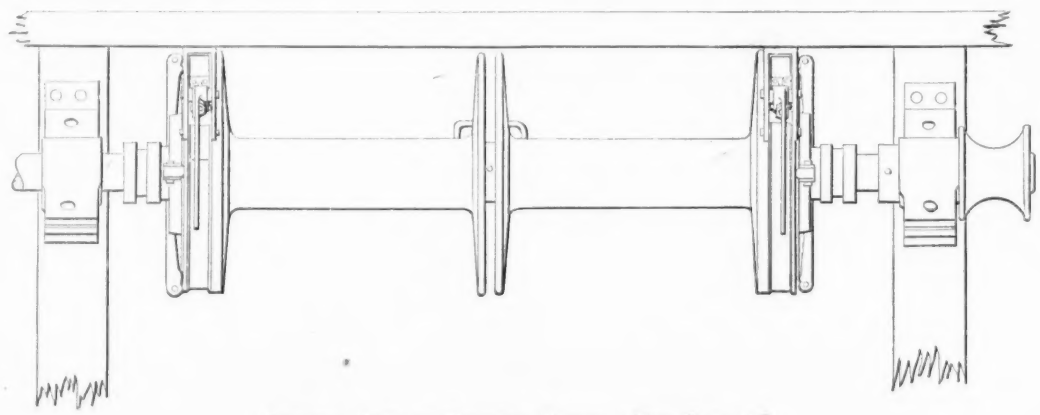
cylinders, and found it some two feet or more wider than the opening after taking out the wooden door-frame, and the way the engine was put together it would be impossible to take the cylinders off. He feared that when the Messrs. Sellers undertook to move the engine, they would find it like Robinson Crusoe's boat. William the driver said he could not help saying, "maybe the stone-mason's hammer and chisel will soon make the door right." This trivial matter must have made a lasting impression on Mr. Rogers, for twenty or more years later he asked me how we had got the engine out of the house it was set up in, adding, "I have always been curious to know."

Fifty years ago, the time I am now writing of, the mechanical engineer was no more exempt from difficulties in the introduction of anything new and untried than he has been at any subsequent period. All our arrangements had been made to deliver our first locomotive "America" from our shops to the head of the incline plane over a hilly country road of about six miles, when we received a note from the canal commissioners stating that they had become satisfied that our outside connected engine, with the spread of its cylinders, would produce so much oscillation as not only to be injurious to the engine but to the track, if the engine could be made to keep it, but this might be partially remedied by placing side bearings on the truck; that unless they were put on, the engine would not be allowed to run on the road even for a trial. Here was a serious dilemma. Having had a full understanding with Mr. Brandt as to carrying the weight on the center-pin, and to satisfy the commissioners, having adopted outside frame and bearings for the truck axles, with separate spring to each journal, there was nothing above this outside truck-frame to which a support could be applied. Baldwin's springs over the outside wooden frames with its center-pin passing through them, resting on a cast-iron grease-box on the truck-frame, admitted the truck to turn as much as required in running the curves. The J. B Jarvis truck which we had seen on the Hudson and Mohawk had a better arrangement for turning, each axle-bearing having separate springs; the side supports were rollers or wheels having their bearings in boxes attached to the engine-frame, with flat iron plates on the wooden truck frame. I had so much confidence in the steady running with the bearing on the center-pin without side supports, that in hopes of getting permission from the commissioners to allow the trial, agreeing in case the engine was found unsteady to put inside frames to the truck and supports to the iron frame, I at once went to Parksburg to see Brandt, and, if possible, get his influence with the commissioners to allow the trial. He was greatly surprised on reading the note, and could not imagine what influence had been brought to bear; he returned with me to the city and said all he could to induce the commissioners to allow the trial. No; they had laid the subject before their engineers and several reliable mechanics; the verdict was unanimous that at any speed beyond a walk the engine would certainly jump the track; Mr. Brandt in his characteristic way asked Mr. Cameron if he could not sit steadier on a three-leg than a four-leg chair on an uneven floor. Mr. Cameron replied, "that is not the question; it is the oscillation caused by the alternate action of the pistons in the widespread cylinders that we fear." I urged that the inequalities of the road would only be felt half as much with the weight carried on the center of the truck; that the weight would always be equally divided among all four wheels; that the engine would run steadier and be less liable to leave the track. They would not yield; side supports must be applied before the engine would be allowed to go on the road. The position of the cradle carrying the center-pin socket or step where it passed under the iron frame of the engine was about 10″ distant from it, and it was only about 5″ wide. It would not be impossible to build on this, and to the frame so as to adopt the Jarvis roller; but I was bent on having a trial without any side support, and this could not be done without connivance with Brandt.

After hours had been wasted in these discussions I suggested suspending from the frame of the engine a kind of pendulum in the shape of a segment of a wheel that



would represent about 14″ diameter, with sufficient length of its periphery, which was to rest in a grooved box secured to the cradle to allow the truck to turn the shortest curves, in fact the Jarvis roller or wheel enlarged from about 2″ to 14″ diameter. Gravity would always keep it in position. This plan was approved; it could be applied without delaying the delivery of the engine, only requiring two holes to be drilled in each iron frame to secure the joint or axle, and a like number in the cradle to fasten the grooved step; these wheel segment supports were forged of wrought iron about 1″ thick. I have spoken of connivance with Brandt; when I told him of my intention of slotting the axle-hole so as to allow a play up and down of about 1½″ he was much amused, but insisted on having a template sent him, that he could have an extra pair made without slotting the holes, saying he would be on the engine when first steamed up, and if the engineers and wise mechanics were right, he would have a solid pair ready to put in; the slots were hid by large washers, and to keep these sham supports firmly in place the spaces above and below the axis were filled with soft white pine.



OUTLINE VIEW OF FRICTION DRUMS. [SEE PAGE 1.]

I have no memorandum at hand of the date the engine was put on the road, but it was not later than the first of September, 1835. Supposing all difficulties in the way of a fair trial of the engine had been overcome, and while my brother was engaged in loading the engine on to the truck and removing it to the railroad, I was surprised at finding in our city office a note from Mr. Charles Chauncey, who at that time was one of the most prominent of Philadelphia counselors-at-law in patent cases, asking an immediate interview, stating that M. W. Baldwin had instructed him to commence an action by injunction to prevent the running of our locomotive then being placed on the railroad, on the ground of infringement of two of his patent claims; that he, Mr. Chauncey, had declined taking the case, and that he had assured Mr. Baldwin that if we were infringing, it was without knowledge, and he had no doubt as to our making it right without recourse to law; that he had induced Mr. Baldwin to allow him to act as umpire between us; he therefore requested an immediate interview. Our position with Mr. Chauncey was one of long-standing family intimacy and friendship. At the time of our father's death, which occurred in May, 1834, we received a letter of condolence from him, in which he said it was his wish to extend his friendship for our father to his sons, and although he was retiring from active practice at the bar, occasions might occur in our business transactions requiring legal counsel and advice; in that case he hoped we would freely call on him as a friend. From that time our intercourse was of the most friendly character, and more than once we were indebted to him for valuable counsel and advice.

When I considered our previous friendly relations with Mr. Baldwin, I was completely taken aback. His shop in Minor street was but half a block from our office, and after his removal to Lodge Alley but two blocks away, a single week had never passed without our meeting either at his shop, or at the Franklin Institute, or in our own office, where he frequently came in company with his friend, our uncle, Franklin Peale, whose position as manager of the Philadelphia museum required frequent consultations with me as chairman of the executive committee of that institution. These meetings apparently friendly, the locomotive we were building was frequently a subject of conversation. Mr. Baldwin expressed great interest in what he called the experiment of iron frames and outside connections; I do not remember his ever expressing a decided opinion of them, but as to carrying the weight on the center of the truck, he was very decided, predicting failure and a necessity of side supports. The nearest he ever came to expressing an opinion as to outside connections was that he should watch with great interest the oscillative or vibrative effect on the engine, and incidentally asking if I had ever considered the difficulty in keeping the inside bearing-journals of the driving-axles lubricated. From this I inferred that he was somewhat skeptical. I felt greatly aggrieved at Mr. Baldwin's course, for he had never made any allusion to his patent claims.

I hastened to Mr. Chauncey's office, no doubt showing some nervous excitement, for an entering, Mr. Chauncey opened the business in his mild way by assuring me that his note was dictated by friendship; that he had fully impressed Mr. Baldwin with the danger of commencing action by injunction requiring security, and in case of defeat subjecting him to damages; that on his declining to take the case against us, Mr. Baldwin had asked if he was to understand that he would act as counsel for us against him? He replied that he would act for both parties as far as lay in his power to prevent needless litigation, but if it was forced on us he should certainly give us the advantage of his advice, but he would not take an active part on either side. Mr. Baldwin had finally left with him his patent specification and claims, pointing out wherein he considered us infringing, and had consented to his writing to us.

He then handed me the specification, requesting me to read it and the claims with care; after I had done so he stated that Baldwin in the first place claimed that we were infringing his combined wood and cast-iron wheel; I made a sketch and explained our continuous box rim filled with wood, with sufficient bearing on the cast-iron for the tire in case the wood should be destroyed by heat in shrinking on the tire. To his question as to how we had prevented the unequal contraction of the cast wheel that Baldwin claimed to have done by the separate or non-connected flanges on the ends of his cast-iron spokes, I replied, only proportioning the thickness of the parts, casting under considerable head with gates of ample size to feed metal as long as the casting in cooling would take it, and by leaving the casting in the sand for twenty-four or more hours with a charcoal fire on it for some twelve hours, slow cooling or annealing as far as practicable without an annealing furnace. Mr. Chauncey's practice in patent cases and the attention he had paid to mechanics made him very prompt in expressing his opinion that there was no infringement, saying wooden felloes are not patentable; they having been in use from the time of the Egyptians, the only sustainable claim could be for a peculiar combination. He then added: "Mr. Baldwin did not seem very confident as to his claim being infringed, but he laid great stress on his claim for ground metallic joints for steam and water pipes." To this I replied, that appears to be a claim for protection in doing good work, and that any one should make it was astounding; that in the practice of my father's shop from my earliest recollection, well-fitted metallic joints was the rule, canvass and red lead a rare exception. Mr. Chauncey asked me to reduce to writing what I had to say on that subject, and let him have it that evening; that he had an early appointment with Baldwin for the next morning, and named the hour he would see me.

In drawing this paper I referred to the custom of our shop, and our manner of making metallic steam or water-joints; that we had long known by experience that a lump or fullness could not be ground off without making a corresponding depression in the opposite; that the joints on the locomotive steam-pipes were as they came from the lathe, having been tried under direct pressure, with Venetian red finely ground in oil; that care and little practice showed where the scraper, if required, was needed; also, when it had done its work, the joints were not ground. I referred to the gunbarrel steam-pipes of the old Hawkins engine, one barrel coned into the other and drawn together with clamp-bolts that had carried steam of 800° temperature, and where these pipes, then in existence, could be seen. I also referred to Jacob Perkins, English patent of 1824, as published in Newton's journal, claiming the uniting of steam-pipes by a short double-cone section drawn into the ends of the steam-pipes reamed out conically to receive them, drawn together by bolts through flanges on the steam pipes, said to have carried steam of 1,000° Fahrenheit; also, to the account of steam-heating the house of Sir J. Sloan, London, which I believe was the first published account of heating by steam-pipes, the joints of these pipes being metal to metal, as described in the Perkins patent.

At the time appointed, as I went into Mr. Chauncey's office, I met Mr. Baldwin coming out; his passing-greeting was hurried and excited; what had passed between him and Mr. Chauncey I never knew, nor did I inquire, for Mr. Chauncey said to me, "You put your engine on the road, you will never here more of these patent claims." This episode did not produce any estrangement; after-meetings were always pleasant; neither of us ever reverted to it.

As I have before stated, this our first locomotive was put on the State road early in September, 1835, my elder brother Charles and Mr. Brandt handling the throttle on its first trip to Columbia and back with a freight train; after this, my brother made other trips with the runner having charge. When satisfied that all was ready for a public exhibition, a round-trip to Lancaster was made, accompanied by the canal commissioners, the civil engineers of the road, and a number of invited guests, Mr. Brandt being on

the foot-board with my brother. During the trip to Lancaster the commissioners and engineers took turns in riding on the engine. Among the invited guests were Dr. R. M. Patterson, director of the U. S. Mint, Adam Eckfeldt, chief coiner, our uncle, Franklin Peale, then assayer, melter and refiner, afterwards chief coiner and inventor of the steam-coining press on which the first steam coinage was struck, March 23, 1836, Mr. Thomas Chauncey and a number of others. M. W. Baldwin was the only invited guest that did not accompany us. General Wm. Norris, though a rival builder, was sincere in his congratulations, and made himself the life of the party. At our dinner at Lancaster he spoke with enthusiasm of the success and unexpected steadiness with outside connections, saying that from it he dated a new era in locomotive building; he could clearly see the time would come for increasing the number of driving-wheels, heavier engines, with a better distribution of weight on the road, making available and using more effectively the steam-power of the engine with less injury to the roadway; he called on the commissioners for their opinion of our engine.

Mr. Jas. Cameron replied that they had been very reluctant in consenting that an outside-connected engine should be built; that they had given way to Messrs. Sellers backed as they were by John Brandt in whom he had great confidence; that he must confess to being very agreeably disappointed, as all who had seen the performance could bear witness to the great steadiness of the engine on the road; he had ridden on all their engines, and this was certainly the steadiest; then turning to me he said: "You now see the wisdom of our insisting on the outside supports from the trunk frame. Where would we have been left if the engine had been allowed to rock on its center-pin with every stroke of the pistons?" When about taking the cars for the return trip, I crawled all around the engine; then standing on a level track, directing Mr. Cameron's attention to the side supports, I took hold of one and raised it clear of its bed groove. "What," asked Mr. Cameron, "is the axle broken? we must have a new one put in before we start; I feared they were too light to bear the thrust." Going to the other side, and taking hold of the other one I found it jambed, and was obliged to jar it with a hammer before I could raise it. "What," asked Mr. Cameron, "is this one also broken?" I directed the pins to be taken out to show the slots. As this was being done Brandt came to my assistance, with the duplicates he had made in hand; showing them to Mr. Cameron with the ones that had been slotted, he said, "With your positive order I could not let the engine go on trial without having these in case they were required." "Ah! Johnnie, Johnnie," said Mr. C., "you are a sad man, I see you believe in the old Scotch adage that the proof of the pudding is in chewing the string. I think this time you have chewed it pretty fine. I was going to say take off the things, but on second thought they had better be left on as a safeguard in case of rocking too far on a sudden lurch." The other engine went out without any side supports. On our way back to Philadelphia my brother came from the engine into the car, and asked the commissioners how they liked the performance of the engine; the answer was, that it was perfectly satisfactory, and if we would call at their office, an order on the treasurer would be ready for us. We had no written contract; the understanding was if the engine performed satisfactorily we were to be paid $5,000. When I called I was handed a draft for $5,500, Mr. Cameron explaining that the $500 had been added for the lever attachment to throw part of the weight of the forward end of the engine on the drivers instead of applying the Miller attachment.

A correspondent of the *Ironmonger* writes as follows:

Being a buyer in one of the largest mercantile houses engaged in the hardware trades, and constantly coming in contact with Australian, Canadian, American, and other dealers in our manufactures, I have had occasion to compare notes with them on the subject of American competition in our colonies, and, though a thorough-going "Britisher," I have been beyond doubt convinced of the truth of their remarks, viz., that "English goods are being substituted everywhere, where possible, for articles of American manufacture, but that the latter are finding much favor," more especially when one finds such goods as lamps, chandeliers, locks, spades, axes, edge tools of all kinds, machinery, pumps, glass and emery paper, mincers, forks, carriage-builders' and saddlers' stuffs, and a hundred and one other articles too numerous to mention, being constantly ordered of American manufacture on indents of English goods, let alone those being called for direct from America.

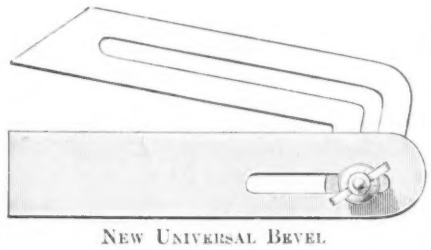
Special Arrangements of the Hotchkiss Mechanical Boiler Cleaner.

This device, as we have previously illustrated it, was for freeing the water in the boiler of mud, sand and dirt, and of lime and minerals set free by the heat of water, thus preventing the formation of scale. These impurities will, while the water is in a state of agitation, rise to the surface, when, by means of circulating pipes, they are carried to a reservoir situated at top of the boiler, then permitted to settle, and are from time to time blown out. When arranged for this purpose alone, the reservoir is reversed in position from that shown in Fig. 1—that is, the partition shown is at the top instead of at the bottom, and the circulating pipes enter at the top and the blow-off is at the bottom. This compels a downward current of the water circulated through the reservoir, then an upward current to reach the return pipe. But the sediment being heavier than the water, and the water in the reservoir being comparatively still, the heavy matter will not rise after it passes the partition but will settle at the bottom, and is blown off, as previously referred to.

Sometimes, however, as when surface condensers are used, oil is the foreign substance which it is desirable to remove. Then the arrangement is as shown in Fig. 1. Oil being lighter than water will rise to the top of the reservoir, and is blown off there. The cut so clearly shows how this is accomplished as to render description unnecessary. Arranged in this way the cleaner will also free the water from magnesia, which is so light as to rise to the surface instead of sinking to the bottom.

When boilers are troubled with both light and heavy matter, as oil and lime, the arrangement is as shown in Fig. 2. In this instance the partition, which is not represented, is at the further side, and the circulating pipes enter against the partition at the back side and not at the center, horizontally, as they appear to do. By this arrangement the lime or heavy matter is given an opportunity to settle to the bottom and is blown off at the lower blow-off, while the oil or light matter rises to the top and is blown off. These two engravings represent new adaptations of the general principles involved in the operation of the cleaner.

The manufacturer of these cleaners is James E. Hotchkiss, 86 John street, New York.



NEW UNIVERSAL BEVEL

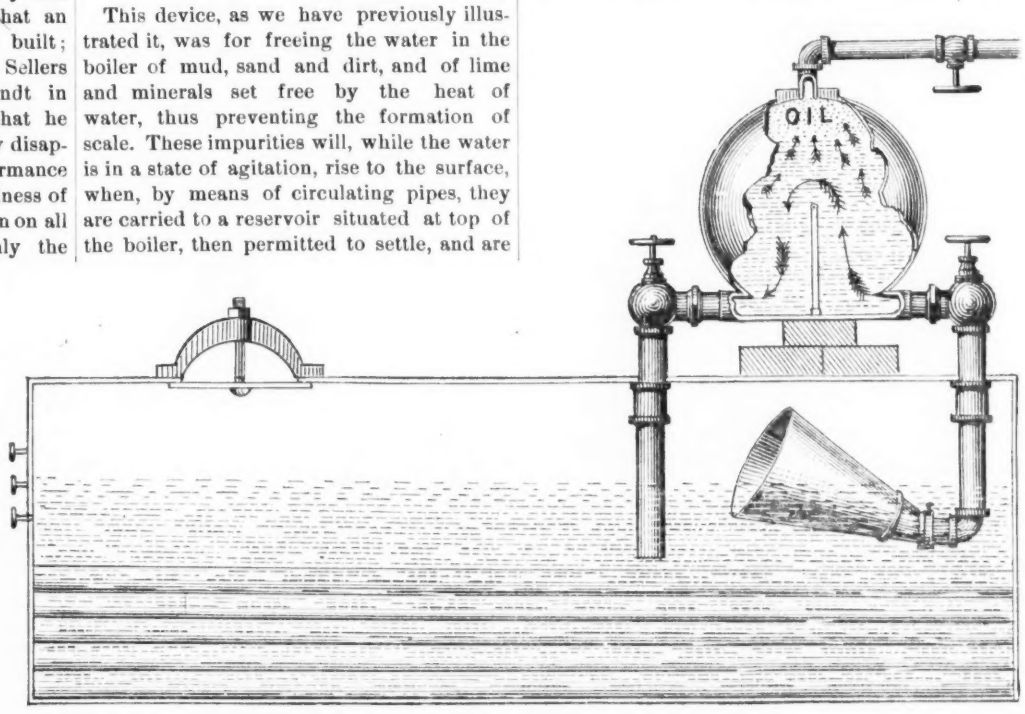


FIG. 1.

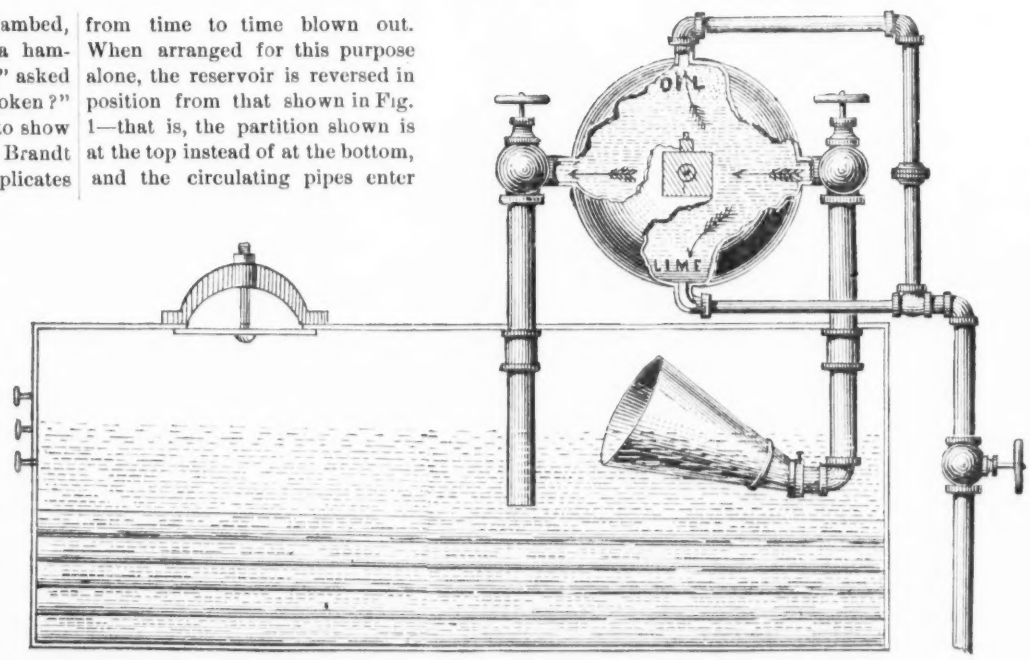


FIG. 2.—MECHANICAL BOILER CLEANER.

New Universal Bevel.

The engraving represents a new bevel made by L. S. Starrett, Athol, Mass. It appears to be a decided improvement over tools of this kind as ordinarily made. By means of the set-off in the blade, its capacity is largely increased, as it may be set to any angle, however slight, and the entire length of the blade. This will be found advantageous in bevel gear-work, and in numerous other instances.

Another valuable feature is, that the case or beam is solid under the tongue for nearly its entire length. This gives a solid rest under the blade, where thin templates may be tried in fitting.

Observations in a Machine Shop.

BY TANGENT.

SECOND PAPER.

When I wrote about shop foremen I was not angling for anybody in particular, but I am inclined to think I caught one of those very fellows that I meet once in a while. He uses the signature W. M. Now if that don't stand for Sam Carson I'm no Yankee. Sam is, or was when I last met him running a shop for Bruiser & Co. down in Providence. Sam was a good fellow. I used to work with him years ago, as nice a workman as I ever met, and a square fellow through and through. He had lots of conceit though, and it would crop out. When he got that job with B. & Co. he took hold with a vim, although he had only about twenty-five men. According to his talk, when I used to run in and see him, he was the hardest-worked man in the country. He used to lecture me on my laziness, then wonder how I could find time to leave the shop for a day. When I told him I proposed going away for two weeks in September, he shook his head and remarked that there were some folks when they had a good job didn't know how to keep it. As for him he had not lost a day for two years; then he told me how hard he worked and what cares he had.

I really pitied the fellow. He took me down to his desk and showed me a sketch he had got out for a tool that he had seen illustrated in the AMERICAN MACHINIST, and was going to make some time; would do it right way, only Bruiser (you know Bruiser runs the shop) was growling about the cost of tools. Did I not read the AMERICAN MACHINIST? Not much; I got enough of machine shop, I hoped, without reading about it. That was too much for Sam. He got mad and said that all a machine shop troubled me would not hurt much. Then he said some other things, and I got mad. We always do get mad, mutually, every time we meet, and yet we are the best friends in the State. Said I, "Sam, I do read the AMERICAN MACHINIST, and I remember a fellow that used to write for that paper; his name was Chordal, and I remember he told of a foreman who spread himself all over a shop, and he spread himself so thin that it did not amount to much. That is just what you are doing out there in that shop. You can't leave your work for a day because every thing depends upon you. Sam, I've got a hundred men to look after at Smith's. When I left this morning I went to the office and told young Smith I was going down to Providence with my wife on the 8:40 train. Then I told Tom Nixon I was going, and left. Tom is running the shop to-day just as well as I would if I were there. I've been there for 10 years. I don't know how much pay you get, but I would want more to have all the worry and fuss you are having. You want to get up tools. Well, *you need them*, but old Bruiser puts his foot down; he won't spend a few dollars on improvements; I would not bother myself: you don't own the shop. Then we both cooled down. He asked me about those drills then, but as I had no experience in that kind of work I could not tell him. Then we talked about other things a little, when he could find time, and wound up with another row about treatment of men, but I have not got time to tell you of that.

Modern Locomotive Construction.

BY J. G. A. MEYER.

THIRTEENTH PAPER.

THE EFFECT OF LAP.

When only one slide-valve is used for the whole distribution of steam in one cylinder, as in locomotives, and the valve has no lap, we may justly name the form of such a valve a primitive one, because valves without lap, or with only a trifling amount, about $\frac{1}{16}$ of an inch, were used in locomotives years ago, when the great necessity for an early and liberal exhaustion was not so well understood as at present, the chief aim then being to secure a timely and free admission of steam. Such valves, as we have stated before, will admit steam during the whole length of the stroke, or, in other words, follow full stroke, and release the steam in one end of the cylinder at the same moment, or nearly so, that the steam is admitted into the other end; this is certainly no profitable way of using steam, for the following reason:

The process of exhausting steam requires *time*, and therefore the release of steam should begin in one end of the cylinder some time before steam is admitted into the other end, or, we may say, the steam which is pushing the piston ahead should be released before the end of the stroke has been reached. This cannot be accomplished with a valve having no lap, and, consequently, when such a valve is used, there will not be sufficient time for the exhausting of steam, thus causing considerable back pressure in the cylinder. In order then to secure an early exhaust, lap was introduced; first, $\frac{3}{8}$ of an inch lap was adopted, then $\frac{1}{2}$ of an inch. But it soon became apparent that working the steam expansively (a result of lap, besides gaining an early exhaust) additional economy in fuel was obtained, hence the lap was again increased until it became $\frac{7}{8}$ of an inch, and, in some cases, 1 inch, and even more than this. At the present time the lap of a valve in ordinary locomotives with $17'' \times 24''$, or $18'' \times 24''$ cylinders is $\frac{7}{8}$ to 1 inch, and, in a few cases, slightly exceeding this. From these remarks we may justly conclude, that in these days, the purpose of giving lap to the valve, is to cause it to cut off steam at certain parts of the stroke of the piston, so that during the remaining portion of the stroke the piston is moved by the expansion of the steam. When steam is used in this manner, it is said to be used expansively.

Now, since the aim of giving lap to a valve, is to cause it to cut off steam at designated parts of the stroke of the piston, it will be necessary first to study the existing relation between the motion of the crank-pin and the motion of the piston.

RELATION BETWEEN MOTION OF CRANK PIN AND MOTION OF PISTON.

In order to illustrate this subject plainly, we have adopted in Fig. 52 a shorter length for the connecting rod, than is used in locomotives.

The circumference of the circle *A B M D*, drawn from the center of the axle, and with a radius equal to the distance between the center of axle and that of the crank-pin, represents the path of the latter. We will assume that the motion of the crank-pin is uniform, that is, that it will pass through equal spaces in equal times. The direction in which the crank-pin moves is indicated by the arrow marked 1, and the direction in which the piston moves is indicated by arrow 2.

In order to trace the motion of the piston it is not necessary to show the piston in our illustration, because the connection between the crosshead pin *P* and the piston is rigid; hence, if we know the motion of one of these we also know the motion of the other; they are alike.

The line *A C* represents the line of motion of the center of crosshead pin *P*, consequently no matter what position the crank may occupy, the center *P* will always be found in the line *A C*. The semi-circumference *A B D* will be the path of the center of the crank-pin *P* during one stroke of the piston; the point *A* will be the position of the crank at the beginning of the stroke, and *B* the position of the same at the end of the stroke. The semi-circumference *A B D* is divided into 12 equal parts, although any other number would serve our purpose as well. The distance between the centers *D* and *P* represents the length of the connecting-rod.

From the point *A* as a center, and with a radius equal to *D P* (the length of the connecting-rod) an arc has been drawn, cutting the line *A C* in the point *a*; this point is the position of the center *P* of the crosshead pin, when the center of the crank is at *A*. Once more, from the point 1 on the semi-circumference as a center and with the radius *D P*, another arc has been drawn cutting the line *A C* in the point 1*p*, and this point indicates the position of the crosshead pin when the crank-pin is at the point 1. In a similar manner the points 2*p*, 3*p*, 4*p*, etc., have been obtained, and these points indicate the various positions of crosshead pin when the crank pin is in the corresponding positions as 2, 3, 4, etc.

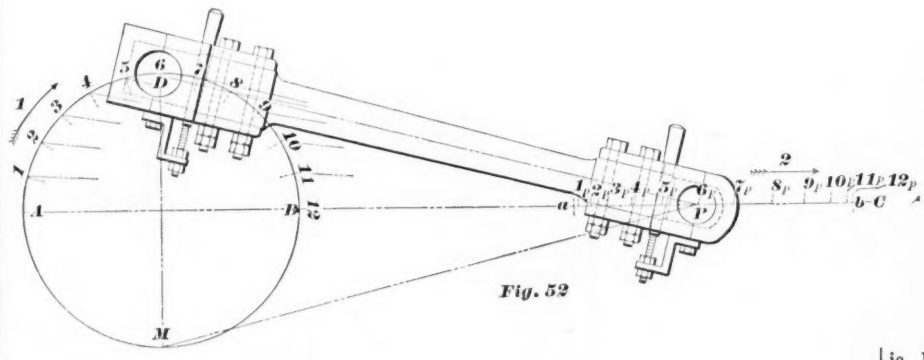


Fig. 52

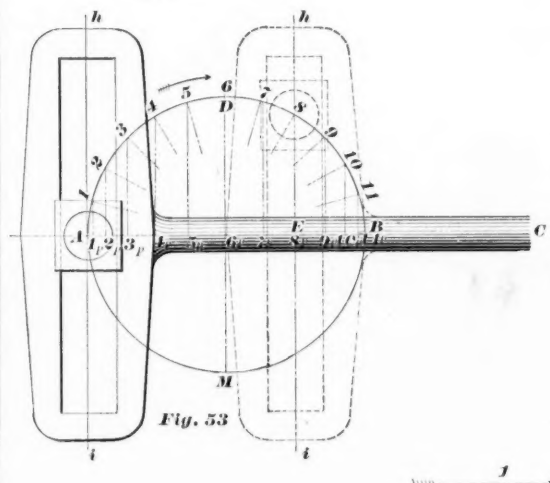


Fig. 53

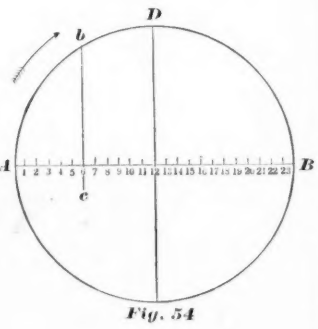


Fig. 54

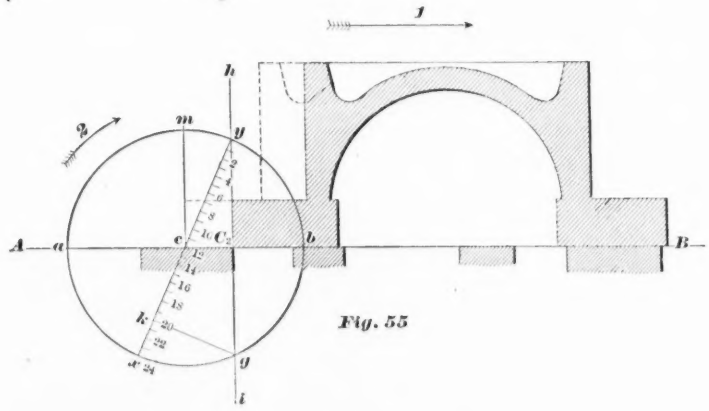


Fig. 55

Now notice the fact that the spaces from *A* to 1 and from 1 to 2, etc., in the semi-circumference *A B D* are all equal, and the crank-pin moves through each of these spaces in equal times, that is, if it requires one second to move from *A* to 1, it will also require one second to move from 1 to 2. The corresponding spaces from *a* to 1*p* and from 1*p* to 2*p*, etc., on the line *A C* are not equal, and yet, the crosshead pin must move through these spaces in equal times; if it requires one second to move from *a* to 1*p*, it will also require one second to move from 1*p* to 2*p*. But this last space is greater than the first. Here, then, we see that the crosshead pin, and therefore the piston, has a variable motion, that is, the piston will, at the commencement of its stroke, move comparatively slow, and increase in speed as it approaches the center of the stroke, and when the piston is moving away from the center of stroke, its speed is constantly decreasing. This variable motion of the piston is mostly caused by changing its rectilinear motion into a uniform rotary motion, and partly by the angle formed by the center line *D P* of the connecting rod and the line *A C*, an angle which is constantly changing during the stroke. Also notice that the distance from *a* to 1*p* nearest one end of the stroke is smaller than the distance from *b* to 11*p* nearest the other end of the stroke, and if we compare the next space 1*p* to 2*p* with the space 11*p* to 10*p*, we again find that the former is smaller than the latter, and by further comparison we find that all the spaces from *a* to 6*p* are smaller than the corresponding spaces from *b* to 6*p*, and consequently when the crank pin is at point 6, which is the center of the path of the crank-pin during one stroke, the crosshead pin *P* will be at 6*p* and not in the center of its stroke. Thus we see that the motion of the piston is not symmetrical, and this is wholly due to the varying angularity of the connecting-rod during the stroke. If we make the connecting-rod longer, but leave the stroke the same, the difference between the spaces *b* to 11*p* and *a* to 1*p* will be less, and the same can be said of the other spaces. Again, if we consider the length of the connecting-rod to be infinite, then the difference between the spaces nearest the ends of the stroke will vanish, and the same result is true for the other spaces. Hence, when the length of the connecting-rod is assumed to be infinite the motion of the piston will be symmetrical, but still remain variable, in fact the piston will have the same motion as that shown in Fig. 53. In this figure we have dispensed with the connecting-rod, and in its place extended the piston-rod, and to its end a slotted crosshead is attached in which the crank pin is to work. Although such mechanism is never used in a locomotive, yet with its aid we can establish a simple method for finding the position of the piston when that of the crank is known. In this figure, as in Fig. 52, the circumference *A B D M* will represent the path of the center of the crank pin, and from the nature of this mechanism it must be evident that at whatever point in the circumference *A B D M* the crank-pin center may be located, the center line *i h*, of the slotted crosshead, will always stand perpendicular to the line *A C*, and also pass through the center of crank-pin.

In Fig. 53, when the crank-pin is at *A*, the piston will be at the commencement of its stroke. During the time the crank-pin travels from *A* to point 8 the piston will travel through a portion of its stroke equal to the length *A E*, which is the distance between the dotted line *i h* and the full line *i h*. If now we assume the points 1, 2, 3, etc., in the semi-circumference *A B D* to be the various positions of the crank pin during one stroke, and then draw through these points lines perpendicular to the line *A C*, cutting the latter in the points 1*p*, 2*p*, 3*p*, we obtain corresponding points for the position of the piston in the cylinder. Thus, for instance, when the crank-pin is at point 1 the piston will then have moved from the commencement of its stroke through a distance equal to *A* 1*p*, and when the crank-pin is at point 2, the piston will then have traveled from *A* to 2*p*, and so on.

From the foregoing, we can establish a simple method, as shown in Fig. 54, for finding the position of the piston when that of the crank is known. The diameter, *A B*, represents the stroke of the piston, and the semi-circumference *A B D* represents the path of the center of the crank-pin during one stroke. For convenience, we may divide the diameter into an equal number of parts, each division indicating one inch of the stroke. In this particular case (Fig. 54), we have assumed the stroke to be 24 inches; hence the diameter has been divided into 24 equal parts. Let the arrow indicate the direction in which the crank is to turn, and *A* the beginning of the stroke; then, to find the distance through which the piston must travel from the commencement of its stroke during the time that the crank travels from *A* to *b*, we simply draw through the point *b* a straight line *b c* perpendicular to *A B*; the distance between the line *b c* and the point *A* will be that portion of the stroke through which the piston has traveled, when crank-pin has reached the point *b*. In our figure we notice that the line *b c* intersects *A B* in the point 6; hence the piston has traveled six inches from the commencement of the stroke.

If this method of finding the position of the piston, when that of the crank is known, is thoroughly understood, then the solutions of the following problems relating to lap of the slide-valve will be comparatively easy:

PROBLEMS RELATING TO LAP OF THE SLIDE-VALVE.

To find the point of cut-off when the lap and travel of the valve are given, the valve to have no lead.

The principles upon which the following problems relating to the construction of the slide-valve are based, have been taken from the excellent "Practical Treatise on the Movement of Slide Valves by Eccentrics," by Prof. C. W. MacCord.

Example 18.—Lap of valve is one inch; travel, 5 inches; no lead; stroke of piston, 24 inches. At what part of the stroke will the steam be cut off?

We must first find the center *c*, Fig. 55, of the circle *a b m*, whose circumference represents the path of the center of eccentric, and this is found, as the reader will remember, by placing the valve in a central position, as shown in dotted lines in this figure. Then the edge *c* of the valve will be the center of the circle. The valve drawn in full lines shows its position at the commencement of the stroke of piston. Through the edge c_2 draw the line *i h* perpendicular to the line *A B*; the line *i h* will intersect the circumference *a b m* in the point *y*, and this point will be the center of eccentric when the piston is at the beginning of its stroke. Now,

assume that the circumference *a b m* also represents, on a small scale, the path of the center of the crank-pin; then the diameter *y x* of this circle will represent the length of the stroke of the piston; the position of this diameter is found by drawing a straight line through the point *y* (the center of the eccentric when the piston is at one end of its stroke) and the center *c*. Also assume that the point *y* represents the center of the crank-pin when the piston is at the beginning of its stroke. To make the construction as plain as possible, divide the diameter *y x* into 24 equal parts, each representing one inch of the stroke of piston, and for convenience number the divisions as shown. The arrow, marked 1, shows the direction in which the valve must travel, and arrow 2 indicates the direction in which the center *y* must travel. Now it must be evident, because the points y_1 and C_2 will always be in the same line, that during the time the center *y* of the eccentric travels through the arc *y g*, the valve not only opens the steam port, but, as the circumference *a b m* indicates, travels a little beyond the port, and then closes the same, or, in short, during the time the center of eccentric travels from *y* to *g*, the port has been fully opened and closed; and the moment that the center of eccentric reaches the point *g*, the admission of steam into the cylinder is stopped. We have assumed that the point *y* also represents the position of the center of crank-pin at the beginning of the stroke; and, since the crank and eccentric are fastened to the same shaft, it follows that during the time the center of eccentric travels from *y* to *g* the crank-pin will move through the same arc, and when the steam is cut off the crank-pin will be at the point *g*. Therefore, through the point *g*, draw a straight line *g k* perpendicular to the line *y x*; the line *g k* will intersect the line *y x* in the point *k*, and this point coincides with the mark 20; hence steam will be cut off when the piston has traveled 20 inches from the beginning of its stroke.

The following method is recommended for coloring soft solder, used for uniting brass without showing the joint:

First, prepare a saturated solution of sulphate of copper blue-stone, in water, and apply some of this on the end of a stick to the solder. On touching it then with an iron or steel wire it becomes coppered, and by repeating the experiment the deposit of powder may be made thicker and darker. To give the solder a yellow color, mix in part of a saturated solution of sulphate of zinc with two of sulphate of copper; apply this to the coppered spot and rub it with a zinc rod. The color may be still improved by applying gilt powder and polishing. On gold jewelry, or colored gold, the solder is first coppered as above; then a thin coat of gum or isinglass solution is laid on and bronze powder dusted over it, making a surface which can be polished smooth and brilliant when the gum is dry.

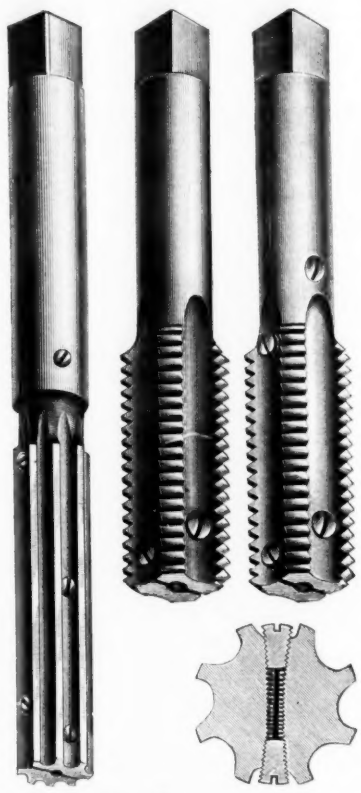
Wm. McPherson, Jr., commissioner of railroads of Michigan, has issued a circular stating that owing to the exhaustive tests of car-couplers at Buffalo, he has concluded to dispense with the tests which he contemplated making. He further says:

But that parties interested and not present at the Buffalo test, may not be excluded from fair recognition by this department, if upon presentation of their device at this office, I am of the opinion that their merits will warrant the incurring of the expense of a practical working test, I will so advise, and suggest a plan for carrying the same into effect, and will give such devices due consideration in making any selections of couplers under the law.

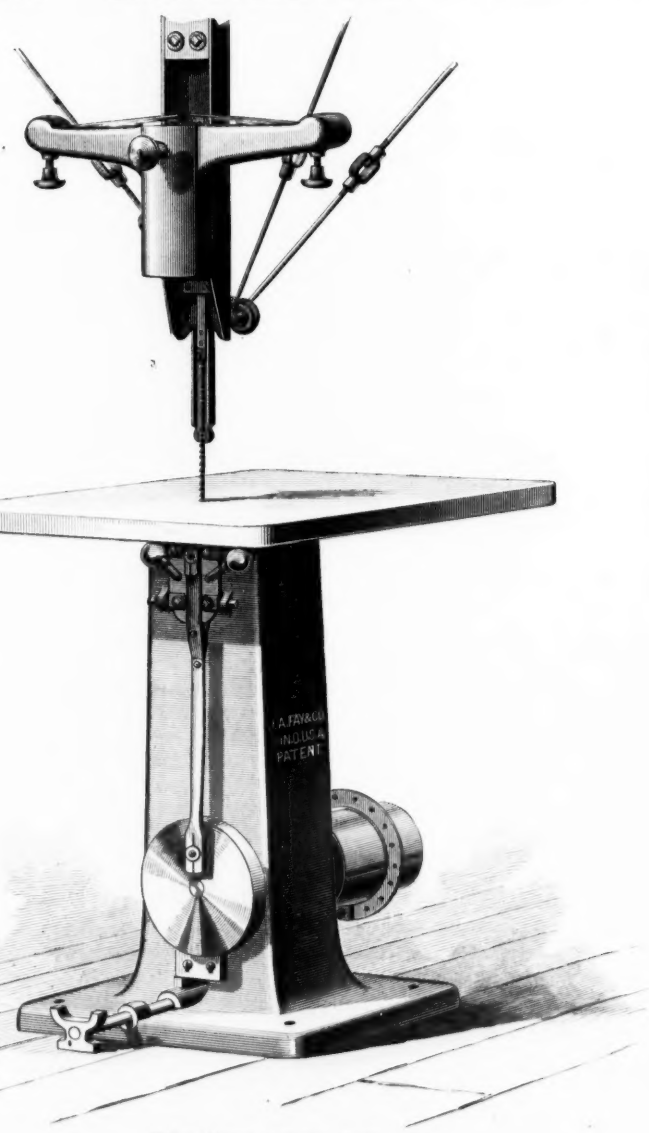
The record of strikes has changed somewhat lately. A few months ago most of the strikes noted were against a reduction of wages; now, most of them are for an advance of wages. Machine shops are seldom troubled with strikes, but there is no prospect of a freedom from strikes in stove foundries until the millennium arrives. It's a dull week for "labor news" that does not furnish items about several new strikes in stove foundries.

A Chance for Inventors.

The world is very slow about light, though it wants light above everything. There is no reason why a Japanese or a Hindoo should not have invented a decent lamp three thousand years ago. There is no new principle in modern lamps and indeed no principle at all except the law of capillary attraction, which the Assyrian knew just as well as we do. It took the world hundreds of years to get rid of snuffers; and at this moment, with millions dependent on the trade, nobody will rid us of the grand drawback to the use of the mineral oils — their sickening and abominable stench. Purify the oil as you will—and some of the prepared oils look as pure and limpid as water—and still whenever the housemaid is careless—and every housemaid is always careless about lamps—the oil gives forth its poisonous odor. Is it really beyond the reach of mechanical science to make a lamp which, by burning its own smoke or other device, literally cannot smell? We do not believe it; but, nevertheless, though a smokeless lamp would yield a fortune to the inventor, and though every house wants lamps, and though all men have a keen dislike of the smell of burning oil, the necessary improvement will not be made. We still burn oil in machines identical in principle with the Assyrian lamp, though we have learnt to be intolerant of the incense and perfumes with which Sardanapalus kept down, or, so to speak, drowned the abominable stench.—*London Spectator.*



ADJUSTABLE REAMER AND TAP.



NEW FRET SCROLL SAW.

The *Official Railway Guide* says: "The third trans-continental tea train over the Denver & Rio Grande Road, consisting of 15 cars, passed through Pueblo at 8 o'clock on the morning of September 4th. A fine piece of switch work was done by the railroad boys when it arrived; they changed engines, changed cabooses, and added three more cars of freight to the train, all on the wing, not stopping the train at all, which kept right on running through the town at a rate of not less than 12 miles an hour."

French's Adjustable Reamer and Tap.

As will be seen from the engravings, a longitudinal slot extends from the end of these tools entirely through the cutting portion, and well up into the shank. The two parts thus divided are held firmly together upon taper screws inserted in the slot. The object of this is to provide slight adjustment which may be required from wear, or for other purposes. Thus, to increase the cutting size, the binding screws are slightly loosened and the taper screws turned in; to decrease the size, the taper screws are turned out.

The action of the screws is such as to prevent any tendency the divided parts may have to slide by each other in use. The reamers are ground to standard sizes, and taps made with either Franklin Institute, Whitworth or standard V threads. In the bottoming the expansion is at the end of tap; in the through tap the expansion is parallel. The manufacturers are the French Adjustable Tool Company, Providence, R. I.

New Fret Scoll Saw.

This machine is designed particularly for the lighter kinds of scroll sawing found in furniture, sash and door, and other shops where a reliable machine of small cost is desired. It is built upon a substantial column of cored section, with broad base, insuring a good floor support.

The reciprocating parts are very light. The crosshead is made of steel, and runs between gun-metal slides which are arranged to adjust to take up any wear, and are also provided with self-oiling devices for maintaining a constant lubrication.

The deflecting strain is produced by two steel springs, constructed of a series of plates of graduated lengths. To one end of these, straps are attached extending to a segmental pulley, by which as they are wrapped; the leverage is lessened as the strain upon the springs is increased, thus compensating for the distance the saw travels in the length of its stroke.

The tension is very even throughout, the arrangement being such that as the saw is drawn in its downward stroke, the lessening flexibility of the springs is compensated for by the diminished leverage of the eccentric roller.

The deflecting springs are attached in a sliding crosshead, adjustable to suit the thickness to be sawed. Screw stays are sent for bracing and retaining the top part in a true vertical line.

The table is of good size, 28″×36″, made of glued up strips of ash and black walnut. Iron tops are furnished when ordered, at a small extra cost.

It is supplied with a brake and shipper for instantly starting and stopping, operated by foot.

The tight and loose pulleys are 6″×3″, and should make 1,100 revolutions.

The manufacturers are J. A. Fay & Co., Cincinnati, Ohio.

LETTERS FROM PRACTICAL MEN.

Something About Levels.

Editor American Machinist:

Mr. Richards' "Chalk Talk" calls to my mind the machinist's level. Of course you have seen them. Levels with acorns on each end, levels with protractor combination, brass levels, steel levels, upright levels, horizontal levels, and levels with centers in their ends, supposed to be parallel with the center of the earth, or some other place. Now, the average apprentice will watch a journeyman use his level, and fix in his mind the exact shape of that level, and every detail of the operation, without once looking into the real connection between the level and the work; he will take it for granted that if a journeyman uses a level on a job, it must be a mechanical fact that all such jobs should be level. He also seems to have a vague impression that every machine in the shop grew level to match levels that also grew level in some indescribable way, and that when the "blubber" in the glass stands in the center all things must be right, as a matter of course, without the necessity for a reason. The reason will be found in that level country where the levels and machines grew.

But some one will say: "How's he going to level a machine when it is set up?" It don't need leveling. How many tools in the majority of shops stay level after they have been up a short time? But they do the work just as well, if they are only firm. Another says: "They look better level." Do they? If you have a level floor, won't the tools look well enough if they are simply fastened to it? And if the floor is not level the level machine appears to the eye as tipped up. I can imagine only one chance for argument, and that is with a very undulating floor, and no such floor should be used.

But another says that "unless you level up the machine you can't level up the work placed upon it." That is why the level ought to be banished, for here is where the absurdity of its use comes in. I remember a shop where it was a common custom to

level up all work large enough to be placed on the floor under the drill, and it was a fact that that drill did not stand anywhere near level, and if it had been leveled up with its table, the table was not at right angles to the spindle.

If the work had been squared with the spindle, it would have been perfect, whatever the defects as regards the table or the leveling of the machine.

At one time, in that same shop, I remember being told to place one of those levels with centers on the centers of the planer-heads to see if they were in line; this was a common practice; at the same time the planer was not level, and even if it had been, there could be no accuracy in the method.

Who has not seen men put a level on the crosshead, and then on the platen, to ascertain if they were parallel, when the indicator in the level, at the best, is something over $\frac{1}{4}''$ wide—not a very fine indicator, as we now count fineness.

What is wanted is men who think. Don't use any tool through blind following of custom, but rather let the ends be thoroughly considered as of more importance than the method, tools, or skill involved, and machine shops will cease to be, as they are to a large extent rightly called, "expensive luxuries."

C. H. NORTON.

A Correction.

Editor American Machinist:

Referring to the formula given by me Sept. 26th for the thickness of cylinders, I find it is not stated correctly. It should have been:

$T=.0001, D\times P+.225\sqrt{D}$, which you will find will give the result specified. The $.225\sqrt{D}$ should be added to the previous figures instead of being used as a multiplier.

WM. J. SILVER.

Device for Planing Edges of Boards.

Editor American Machinist:

I send you a sketch of a device that I am using in my shop on the pattern-maker's bench. It is very convenient in planing the edges of boards of various lengths and widths. *A* represents the side of the bench, and *B* a strip of wood $4''\times 1\frac{1}{8}''$, as long as desirable, say six feet. Near one end I cut a groove, shown in section at *F*, at an angle of 45° with the edge. *C* is a strip of hard wood of similar section screwed to the side of the bench as shown in the sketch, at an angle of 45°. Now the strip *B* is held at the grooved end by this strip *C*, and at the other end by a pin *H*, which goes through the strip *B* and into the bench. By having a series of holes bored in the side parallel to *C*, *B* may be raised or lowered to suit the work in hand. To adjust it to any width of board it is only necessary to pull out the pin *H* and push or pull the strip *B* to the right height. Care should be taken not to make *C* fit too closely in the groove, as changes in the weather might make it work hard. At *D* is shown the stop I use, and at fig. 2 the construction. *D'* is a hard wood (preferably hard maple) piece, got out in about the shape shown, the shank being about $\frac{7}{8}''$ square. *E* is a screw passing through an angle-iron at *G*. The angle-iron is fastened to *D'* by two screws, and the other limb has a hole drilled through it to admit the screw *E*, which is bent in the form of a crank having a shoulder on one side of the angle-iron and a pin through it on the other side. *D'* is mortised into the bench near the top as at *D*, and is moved in or out to suit the thickness of the board to be planed.

AARON LEWIS.

Mixed Numbers Again.

Editor American Machinist:

Geo. B. Snow makes a couple of mistakes in the issue of Oct. 31st. He forgot to add in the fraction $\frac{6}{7}$, and made the answer $19\frac{30}{49}$, when it should be $23\frac{6}{49}$. The algebra is all right, but he says, "The method given * * * is, as given, only applicable when the fraction is $\frac{1}{2}$, and here he makes mistake No. 2.

In squaring $5\frac{1}{2}$, we add $\frac{1}{2}$ to one factor, and subtract it from the other, precisely as does Mr. Snow; after multiplying, we add the square of $\frac{1}{2}$, which is $\frac{1}{4}$, to the product of $6\times 5=30$; $30+\frac{1}{4}=30\frac{1}{4}$ for answer:—Take $5\frac{1}{4}$, add and substract, and we get $5\frac{1}{2}$ and 5 as factors; $5\frac{1}{2}\times 5=27\frac{1}{2}$, add the square of $\frac{1}{4}$, which is $\frac{1}{16}$, and we have $27\frac{9}{16}$, the answer.

Mr. Snow will see that not only is the principle the same in the three examples, but the methods are precisely the same.

JAMES F. HOBART.

Drying Cores by Steam.

Editor American Machinist:

Mr. King, Master of Machinery of Wisconsin State University, has suggested to me the idea of drying cores by steam, that is by placing a coil of pipe in the core oven, keeping the pressure, say, at 100 pounds. His idea is, that by this you will get rid of smoke and soot, and effect a saving in fuel, building fires, etc.

I should like to hear if any one has had experience in this direction.

ROBERT E. MASTERS.

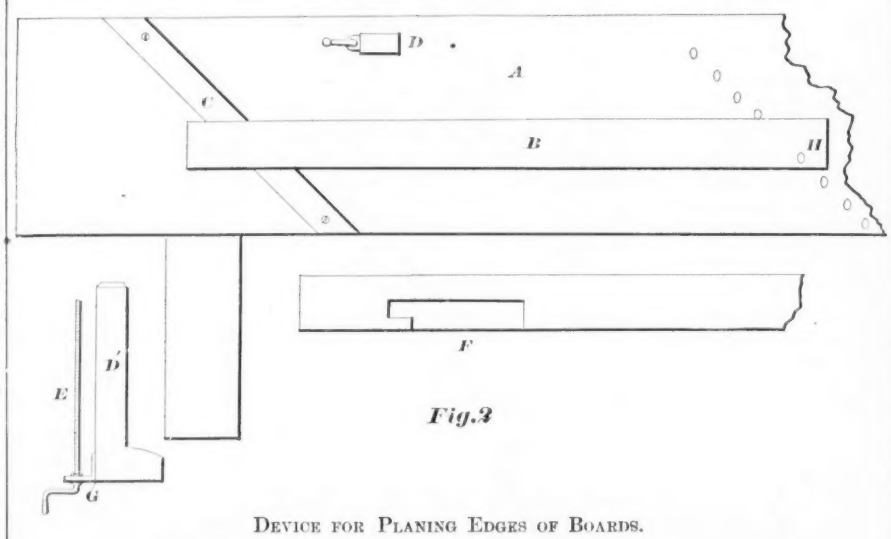


Fig. 3

DEVICE FOR PLANING EDGES OF BOARDS.

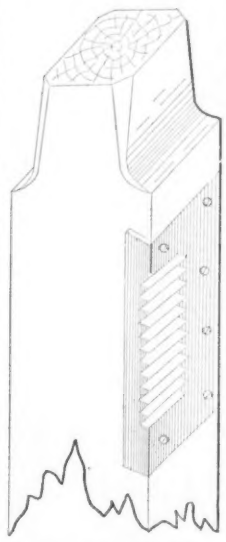
Clamping Flasks.

Editor American Machinist:

Although it is a generally-accepted fact that for general foundry-work iron flasks pay best in the long run, there is, nevertheless, a large class of work which every foundryman of varied experience knows must still be made in wooden flasks. The constant changes to which such work is subject makes wooden bars indispensable.

Accepting that fact, it seems strange that there is so little care taken of them. Great pains is taken by some men in protecting them from the weather, but there their vigilance ceases; they seem to think that so long as they are under cover it is all right.

Dumping out is where a wooden cope catches it, especially if it is a large one. Blocking up in the center of one end between cope and drag, and then taking a bar or heavy clamp and smashing down on top of the corner, is a very expeditious method, and one often adopted by moulders after a heavy cast and in a hurry home. In the interest of all concerned, this should never be allowed, as the flask will soon resemble a rubber rather than a wooden one, with the certainty of a drop-out sooner or later, and its accompanying profanity.



CLAMPING FLASKS.

Another engine of destruction to copes is the sharp point of a clamping bar. See that moulder clamping up; his clamp is an inch, more or less, longer than the flask is high; he puts a piece of wood—soldier, probably—between the toe of the clamp and the top of the box, then shoves the bar under the toe. With the sharp point resting on the cope, he pries the clamp along until it is tight—a very good way to tighten a clamp when heavy strains are to be overcome, also to split off the outer edge of the flask side—and until, with the aid of an occasional rap from a clamp in dumping out, it stands at an angle of 45° with the inner side. It is then almost an impossibility to properly clamp that flask; there is no room to place the soldier without coming in contact with the cope bars, and, in trying to do it without blocking, the clamping-bar will often slip, and the hand will catch the top of a gagger sticking above the bars.

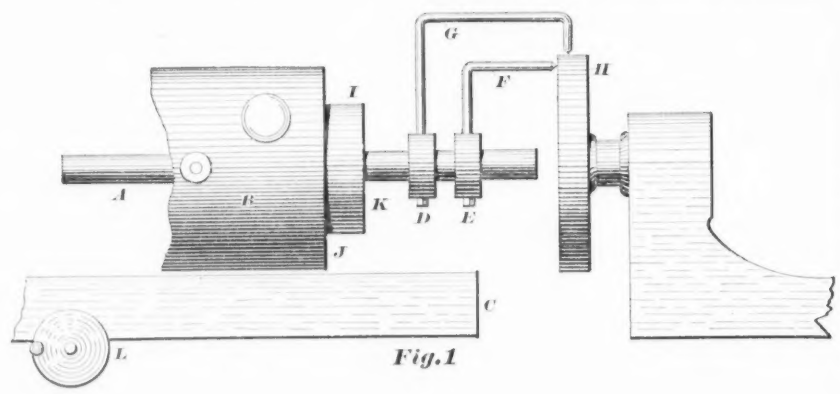


Fig. 1

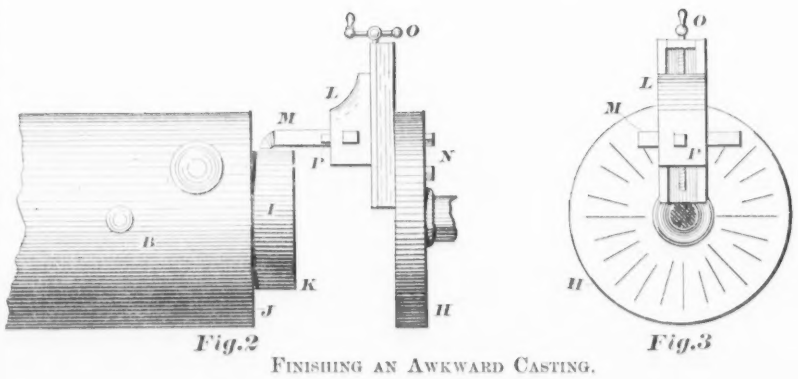


Fig. 2 *Fig. 3*

FINISHING AN AWKWARD CASTING.

The best means I have ever seen used to counteract the effects of the clamping-bar is a small cast-iron plate screwed on top of the cope where each clamp is supposed to come, as shown in the cut. It is only about $\frac{1}{4}''$ thick, and can be easily and quickly put in place. The upper part is let into the wood until it is flush with the top of the flask side; the lower part is left projecting its own thickness over the side, as it is not in the way of anything. The small grooves shown are an $\frac{1}{8}''$ deep and about $\frac{5}{16}''$ apart, and serve not only to hold a clamp of the right length, but to hold the flat point of the bar when clamping with blocking between the toe and the plate. This simple device works well, and keeps a flask in good condition for quick clamping, and not as though a ship's cable had been running over it.

M. E. CHANIC.

Boiler Riveting.

Editor American Machinist:

It interests me somewhat to hear of locomotive boiler makers having been asked to pay a royalty on the use of a certain kind of rivet set, which I have used since 1851, always finding first-class work turned out with it. I am confident that nothing but the best machine riveting can compete with it, and if the heading tool in the riveting machine is not relieved in the same manner the work will not be first-class.

To make this set it should be chucked and a hole about seven-eighths of the size of the rivet drilled about one and a-half inch or more up the center, then countersink the face to about the same dimensions as the head of the rivets used, face off and trim outer corner somewhat rounding like a hammer face, leaving about $\frac{3}{8}''$ to $\frac{1}{2}''$ flat outside of the countersink.

I always use a 12 or 14-pound sledge on this set, and think the heavier the sledge the better the riveting. I have always regarded this style of rivet set as my own invention, and have never seen any other person use it.

If any one will cut the head off one thousand hand-made rivets, and then cut the heads off one thousand rivets made with the above mentioned set, he will readily agree that hand-made rivets are by far the easiest to remove, in fact, he will find quite a number of the hand-made rivets will lose their heads the first or second blow of the hammer, while scarcely any of the set rivets will fly off readily; all of them will be found to have retained the original toughness of the iron from which they were made.

There was a kind of rivet set in use some time since that ruined the name of machine-riveted work, as well as that put up with the rivet set and sledge, in the estimation of those who have never examined into the merit of the business. This set is a simple concave of a little more than the third of a circle, with the outer rim turned nearly to an edge at about 30° with the center line of the set. This makes a smooth, ball-shaped head, and the idea was to cut the extreme edge of the head into the sheet, after the style of hand riveting. But this cutting, which is a great defect in hand riveting, is also a defect when done with the smooth and apparently harmless edge of this worthless set; good riveting cannot be done with it, from the fact that it has not that drawing effect that is necessary, and, so far as I know, it has taken its proper place in the scrap pile.

A. F. WARD.

Cleveland, O.

Finishing an Awkward Casting.

BY JAMES F. HOBART.

Jingo runs a 10x20 shop. He has got three lathes, a planer, a gear cutter, and one or two smaller machines.

One day Jingo took a job to fit up some castings for a leather-scouring machine.

Special machinery, and lots of it, was the

correct thing for the job, but Jingo looked at his 26″ gap lathe and said he could do it.

In Fig. 1, the casting *B* was the worst piece he had to deal with. It was cored out for machinery inside, and the surfaces *I*, *J*, and *K* must be turned true with the axis of the casting.

A pair of babbitted boxes inside the casting was Jingo's starting point. He turned up a nice true shaft *A A*, and ground it to fit the boxes which he had reamed out smooth. His next job was to mount the casting on the slide rest of his gap lathe and true it up.

He put a level on the rest *C*, it was "out" a little. One end of the lathe was "down" a trifle. "No use," thought Jingo, "this thing has got to come right within a thickness of paper in its whole length; now it is four feet long, and it won't do for me to fool around with spirit levels and pine shingles."

Jingo got two collars, *D* and *E*, and put them on the shaft *A*. Next he took two pieces of half-inch round iron and bent them up like *F* and *G*. These he tapped into the collars, as shown. Jingo only used *F* at first. He put this piece in, ran the carriage *C* up until *F* almost touched the face plate *H*.

Now as the shaft *A* is turned around by hand Jingo finds that the finger *F* almost touches the face-plate when it is as shown in the cut, but is off $\frac{1}{16}$″ when hanging down. Jingo shims up under *B*, at *J*, and tries again. After a time he gets it so near right that he cannot see any difference. He also turns it sidewise, and bolts it down. After bolting, he tries it every way he can imagine to see if it is *just* right.

Next he puts in finger *G* and tries that. This throws it out of line bodily. Jingo moves it sidewise by the cross-feed *L*, and up or down by raising back end of the carriage. Pretty soon he gets it *right*. Then he takes out shaft *A*, pulls off collars and pointers, takes the top of a compound rest off a small lathe and bolts it to his face plate, as shown in Fig. 2 and 3, by *L*.

A big crooked tool *M* is made to fit the tool post *L*, and is held by the set screw *P*.

Jingo has got it! He faces up *K* and *J* by turning *O* as it comes around within his reach. The straight piece *I* he turns with the rod-feed of the lathe. He took care to make the tool long enough at *M* to allow this.

Jingo says that the thing is not patented to the best of his knowledge, and he thinks *F* and *G* might be good things whereby to chuck castings in a lathe, provided the pointers could be mounted on the tail spindle, and moved up to the casting when needed.

Next Meeting of the American Society of Mechanical Engineers.

We have from the secretary a programme for the sixth annual meeting of this society, to be held in Boston, beginning November 10. The opening session will be held at Hotel Brunswick, where the society will be welcomed by Governor Robinson, Mayor O'Brien, and General Walker, President of the Institute of Technology. President Holloway will also deliver the annual address at this session; thereafter the sessions will be at the Institute of Technology. There will be an excursion on Boston Harbor; also to the city of Lawrence. The headquarters of the society will be at Hotel Brunswick, on Boylston street, opposite the Institute.

The following papers are to be presented at the meeting:

Thomas Egleston: "The Basic Bessemer Process."

Francis E. Galloupe: "Rapid Transit and Elevated Railroad, with Description of the Meigs Elevated Railroad."

John E. Sweet: "The Unexpected, which Often Happens."

Samuel Webber: "Frictional Resistance of Shafting."

Wm. A. Rogers: "The Microscope in the Workshop."

W. P. Trowbridge and C. B. Richards: "The Commercial Rating of Boilers by Horse-Power."

Wm. Hill: "The Crystallization of Wrought Iron."

Wm. Cowles: "Improvements in Ferry-boats."

Geo. H. Barrus: "A New Calorimeter."

Wilfred Lewis: "Experiments on the Efficiency of Worm, Spiral and Spur Gearing."

Wm. H. Thorne: "Twist Drills,"

George M. Bond: "Standards for Pipe Threads."

C. H. Peabody: "Steam-Engine Tests."

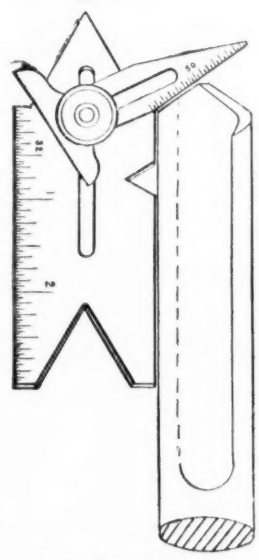
G. Lanza: "The Course in Mechanical Engineering at the Massachusetts Institute of Technology."

The committee ask members to interest themselves to send queries and topics for discussion. The committee also solicit members to present at the meeting brief propositions and the relation of experience, which may be of such a nature as scarcely to warrant the preparation of a formal paper about them. Queries, or the title of matter to be presented, should be sent in advance to the secretary, F. R. Hutton, 280 Broadway, New York.

Screw-Cutting, Center, Depth, Angle and Twist Drill Gauge.

This tool is represented as set for a gauge to be used in grinding twist-drills. The

Fig 10.



TWIST DRILL GAUGE.

operation is as follows: Throw the tongue of the auxiliary gauge back, and set to the angle of one of the lips of the drill. Notice which line of the graduation coincides with the front of the lip; then bring round the other lip, when the difference, if any, will be seen.

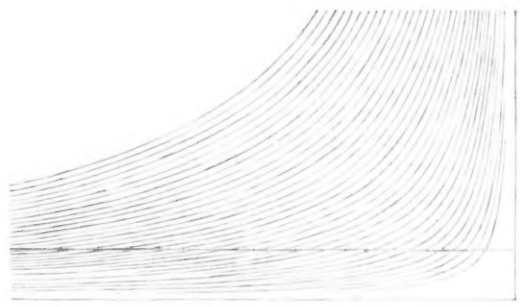
This tool is made by J. Wyke & Co., East Boston, Mass.

The Novelties Exhibition at Philadelphia.

Tallman & McFadden, 607 Market street, Philadelphia, Pa., show an attachment made by the American Twist Drill Company, Meredith, N. H., for turning round-faced pulleys in a common lathe, and increasing the capacity of the lathe from one-third to one-half. This device consists of a tool-carrier which slides to the work as a lever is moved back and forth, by an adjustable connecting-rod, which holds the lever central when the cutting tool is in the center of the pulley-face.

This firm also show a steam jet for fire purposes. It is worked by an unhooking device actuated by a rod which may be carried to any distance. This device is rendered automatic by a fusible joint which melts at 160 degrees, thereby unhooking the lever.

A 10″ screw cutting lathe, by W. C. Young & Co., Worcester, Mass., is fitted with an unhooking treadle device for foot power, and a double-step driving wheel on a shaft in pivoted bearings. The spindle is back-geared five to one. All the gears and small parts are made of steel. A screw feed is operated by a split nut in the apron, A reverse motion in the head stock is worked by a lever at the back end of the tail stock. The screw-cutting gears are compounded. The lathe is fitted to stand up to heavy work.



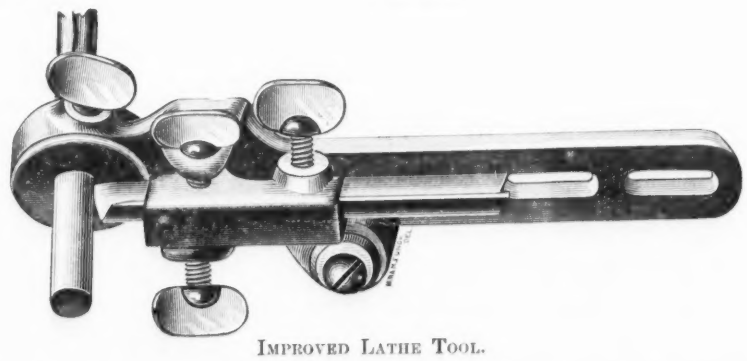
HYPERBOLA CHART.

The Hall duplex pump, by the Hall Steam Pump Company, 91 Liberty street, New York City, needs looking at closely to see if it is at work. There are no working joints to these pumps, and no mechanical devices to operate the steam valves. A plain *D* valve, and a small piston, forms the moving parts of each pump valve. There are no exposed parts for vicious persons to tamper with. As each piston actuates the steam valve of its mate, there can be no short strokes, and the pump is always positive.

Coffin's Hyperbola Chart.

This chart, illustrated half size herewith, is beyond question of great advantage to those engaged in indicator practice, enabling them to almost instantly ascertain the character of the expansion curve of any diagram. We have received the following letter from Prof. John E. Sweet, which so clearly illustrates the use of the chart that we publish it as a description:

"I have been furnished with a proof copy of another of John Coffin's short cuts to results that on trial proves to be more of a success than is likely at first to be imagined. I fancy those who have had much experience in drawing the theoretical expansion curve on indicator cards find it quite a job, and those who want it done, and don't do it, will be glad to possess this little convenience.



IMPROVED LATHE TOOL.

"It is nothing more than a series of hyperbolas drawn at convenient intervals, and printed upon the most transparent of tracing paper with the air line drawn or printed upon the transparent chart to correspond with the spring used in the indicator. The chart can be applied to the indicator card without the trouble of even drawing the vacuum line. To use it it is only necessary to lay the chart over the card with the atmospheric line coinciding with the atmospheric line on the card, slide it along until one of the compression curves of the chart coincides with the compression curve of the card, and observe the coincidence of the expansion curve with either one of the curves of the chart or the center of the space.

"If the absolute clearance of the engine be known, then it is only necessary to mark off the proper point, bring a vertical line on the chart to this point, and any imperfection or variation in both the compression and expansion curves is shown at a glance. If it is desirable to permanently fix the expansion curve on the card, by pricking through the chart, points in the curve may be established. By either following one of the curves or dividing the space by the eye, one may get the true curve more accurately than is likely to be the case by the old method. Should the charts be worn out by this process the cost for new ones is too trifling to be considered.

"A professional having an indicator with various springs will want a chart to correspond with each spring, with the atmospheric line laid off on the chart to correspond, it then takes but a moment to apply the chart to any card taken by that spring and see its defects."

These charts are made by John Coffin, Johnstown, Pa.

Improved Lathe Tool.

This tool is designed to supply pattern-makers and others with a suitable and handy instrument for making round rods of wood for pins and dowels, or for any other purpose. It can be used by holding it in the hand or fastened in a sliding rest, doing the work with neatness and dispatch.

The cutter is independent of the bushing, and adjusted with screws to turn the desired size. The tool is well made, the castings (with the exception of the bushings) being of steel, and the cutters of forged cast-steel.

The size here shown is furnished with interchangeable bushings with standard sized holes of $\frac{1}{8}$, $\frac{3}{16}$, $\frac{1}{4}$, $\frac{5}{16}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$ inch diameter, and three square tapering chucks for holding the work. Larger sizes are made to order, and are designed for use only with a slide rest.

The manufacturer is Isaac Fonda, Laconia, N. H.; Chandler & Farquhar, 168 Devonshire street, Boston, Mass., are selling agents.

A correspondent would like some one to inform him how to make soft solder, the color of sheet brass.

According to the Springfield *Republican*, the substitution of gas for fuel in the water-shops of the Government at Springfield has been entirely successful, resulting in a saving in fuel equal to 33⅓ per cent., and in other savings reckoned to make the total saving 50 per cent. Besides this, there is no smoke or dirt. The gas used is made at the works.

It has been for years the practice of some of the large glass manufacturers of New Jersey to pay their workmen in scrip; this scrip was redeemable in goods usually kept by the manufacturer, or by some ally of his. Finally, it occurred to some one that these parties, who were in effect issuing money, notwithstanding that for all practical purposes it was a good deal diluted, were liable to pay taxes on such issue to the United States Government, under provisions of the law relating to banking, which imposes a tax of 10 per cent. on all notes issued for circulation other than by national banks. Two or three years ago suit was commenced by the Government against one firm to recover this tax, and a decision rendered, which made them liable to the extent of $463. From this decision both parties appealed. The decision of the higher court is that a new trial shall be granted, and that the Government is entitled to recover, not only on the original issue of this scrip, but upon every subsequent re-issue, which will multiply several times the amount of the original judgment.

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NEW YORK, NOVEMBER 7, 1885.

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Selling Machinery on Trial.

In times of close competition like the present a variety of extra inducements, aside from cutting prices, are offered for the purpose of making sales of machinery. One of the most noticeable is the growing practice of selling or sending out machinery on thirty or sixty days' trial, at the end of which time if found unsatisfactory the machine may be returned at the seller's expense and no sale effected. At first thought this might be considered a privilege of much benefit to the purchaser, as saving him from paying for a machine that will not do the work required of it. Upon closer examination, however, the party who really wishes to purchase will find nothing extraordinary in such a privilege beyond the manner of setting it forth.

Machinery of a standard character, made by a reliable establishment, can be rated as to capacity and general characteristics so that the buyer who has a definite idea of what he requires it to do is fairly insured against any loss growing out of giving the order in the usual positive way. If any unlooked-for defects should be developed by use, the manufacturer would protect the buyer by either remedying the defects or taking back the machine. If such a contingency should arise, it is difficult to see how the buyer would be in any better position if he had taken the machine on trial to be paid for if found satisfactory. In buying machinery from a reliable establishment the purchaser needs no more guarantees or privileges of rejecting the articles after trial than are usually given.

In first introducing some new machine or attachment, it is often necessary or at least customary, to set up one of them where it can be tried for a few weeks or months so as to prove its merits, not only to the party using it, but to others who may observe its operation. Such a transaction, however, lacks the essential elements of a regular purchase and sale, whether the article is finally paid for or not. The user does not, as a general case, take the article at first because he feels the need of something of the kind, but rather to accommodate the party introducing it. His position differs therefore from that of the purchaser on trial who knows that he wants the machine he receives. Purchasers who know nothing about the machinery business, as for instance amateurs, may be attracted by the offer to send out goods on trial, but in dealing with parties who are engaged in mechanical pursuits, it seems superfluous to send out machinery with its retention conditioned upon thirty or sixty days' trial.

One Result of the Multiplication of Special Machines.

It must be evident to the observer that the increasing use of special costly tools for rapidly doing much of the work formerly done through ordinary machine shop processes has not worked so much injury to small shops where such tools cannot be afforded as was predicted. More and more every year the work done by such machines is turned out in the way of articles of regular manufacture, and sold in many instances cheaper than they could be made in the small shops even with the special tools, in use only part of the time. There is no occasion in the small shops for machinery for making taps, reamers and such small tools; they can be bought from the manufacturer for less money than they could be made. Gear wheels are carried in stock by manufacturers, and the same is true of other standard parts of machines. Most shops, large or small, buy finished nuts, studs, bolts and set-screws in preference to making them. The establishment of standard sizes and shapes has been a blessing in this respect to the small machine shop; as further standards are agreed upon, the finished parts of machines and machinery that will be furnished from manufactories entirely devoted to their manufacture will be still further increased, to the manifest advantage of the small machine shops. There is compensation in everything; the tendency to special manufacture created by the use of these costly special machines, leaves the prospects of the machinist who starts in a small way in about as satisfactory a condition for achieving success as ever. Those things which he cannot afford to arrange for making cheaply, he is likely to find offered to him ready made at prices lower than they are likely to be produced by any one, except he makes a business of making them.

Building Up Manufacturing Towns.

A number of leading manufacturers of a New Jersey town, together with several city officials, held a meeting recently to consider methods of inducing other manufacturing establishments to locate there. Some of the remarks made at the meeting are of general interest.

As this question is an important one in many towns and cities throughout the country, and probably much the same line of argument and inquiry will be presented in similar gatherings elsewhere, we summarize the proceedings of the meeting with some interest as well as curiosity regarding the ultimate action taken.

A member of the City Council thought that perhaps a reduction of taxation in proportion to the number of men employed would probably be the better method.

A bank cashier, whose opinion was asked, spoke of the rapid growth of a Pennsylvania town, which he named, as an evidence of the wisdom of the policy of offering inducements to manufacturers to locate in a place. He gave an instance of how certain land-owners in their own city had driven away capital by asking exorbitant prices for their land. Said he, "A gentleman who was about to locate works here that would have employed a capital of $500,000 was compelled to go elsewhere on that account." He spoke of the favorable terms offered by several other New Jersey places.

A prominent iron manufacturer made a strong argument in favor of encouraging manufacturers to locate there, and presented the matter very plainly. "Our taxation here per ton of output," said he, "is about double what it is elsewhere. In another town, where we also have works, our tax is about nine-tenths of one per cent., or one-third what it is in this city, and, if we were about to make additional investments, it would certainly be to our advantage to do so out of this city." Taking his own works as an example, he said that it employed 800 hands; the families of these workmen increased the number to about 4,000 people, whose support came directly from these works; fully 1,000 artisans and tradesmen were necessary to administer to the many wants of this number, showing a total of 5,000 people who were directly or indirectly supported by this one industry. They occupy 1,000 dwellings, whose assessed valuation, averaging them at $1,000 apiece, would be $1,000,000, or one-fourteenth of the entire taxable property in the city. The works disbursed for minor supplies a large sum of money; it moved 350 tons of material per day by land or water, thus helping to make the city a business and railroad center. "A manufactory which does all this must be an advantage to your city," he said. "How much so, is for you to determine. The tendency of large manufacturers is to cluster around great cities, selecting places that afford the best facilities for the shipment of goods."

A leading builder, in order to have some kind of a plan discussed, presented a resolution that all manufacturers who hereafter locate in the city, and employ fifty or more workmen, be exempt from taxation for five or ten years. This was at once objected to as unjust by the manufacturers present, who said they would not be able to compete with the new-comers.

One of the previous speakers suggested the plan of cutting a proposed canal, which he thought the city should construct as a municipal enterprise. He said several leather manufacturers near that part of the city had very advantageous offers to take their works elsewhere.

Another speaker proposed to have a committee of councilmen and citizens appointed to visit other places where manufacturers are exempt, and see how the system works.

Another said his firm had offers from a neighboring town, if they would locate there, of exemption from taxation for the term of ten years, adding, "I have authority to state that a party will put up a mill here within six months that will employ a large number of hands if some inducement is offered." Attention was also called to the fact that the same firm had a mill property which was unoccupied because of the taxation in the city on machinery.

A manufacturer made the point that the money paid out as wages by manufacturers is brought from abroad and not drained from the city, but is an addition to its wealth. He was in favor of a reduction of taxation.

The point was then urged that it was the duty of the citizens generally, and not of the manufacturers already located in the place, to invite other manufacturers to come and compete with them. It was suggested that it would present a fairer appearance if, in appointing committees for further action, some taxpayers who were not manufacturers were represented in the matter, to which the inevitable funny man on such occasions appended the further suggestion, that the proposed committee offer a chromo for the best plan of inducing other manufacturers to locate in their town, without prejudice to those already located The outcome of the meeting was the appointment of a committee of five, consisting of the chairman, two manufacturers, and two taxpayers not manufacturers, to obtain further information on the general subject, with a view to suggesting a definite plan to the city fathers.

At the risk of seeming to compete for the funny man's chromo, we will only remark that whatever specific plan may finally be adopted for making the city in question more energetic and more attractive to manufacturers, the persistent cultivation of what may be called "the manufacturing spirit," will hold no mean place, if success is to be assured. This spirit has distinctly an educational, a social, and a political, as well as a business side, and is to be fostered in many ways, if its full benefit is to be realized.

By a misunderstanding which we regret, the statement was made in our issue of Oct. 31, that the Flexible Back Hack Saw, illustrated in that issue, was made of iron. The saw is made of best band steel.

The recent accident on the Pennsylvania Railroad, near Jersey City, by which several lives were lost, is only another illustration of how much the safety of the traveling public depends upon the men who control trains even when the most perfect of systems to insure safety is in force. An error on the part of some one let an express train crash into the rear of an emigrant train delayed for taking coal. Of course the block system in force should have prevented the possibility of this, but this or any other system that can be devised is useless against blundering or incompetency. The only way to lessen the probability of the occurrence of such accidents is to make the pay for railroad service such as to attract men of a high degree of intelligence, then make their hours of labor short enough to permit the full employment of their faculties at their best. There are no irresponsible places in railroad operating, no places that can be properly filled with "cheap" men.

As we have said before, we believe manufacturers in this country are not taking measures to secure to themselves the share of trade with Mexico and the South American States which naturally belongs to them. There, we believe, is where they should especially look for expansion of their business beyond the requirements of home demand. There is in these countries an increasing demand for manufactured goods, and for agricultural implements, mining machinery, etc., to assist in the development of natural

resources. The trade will eventually be large, and is worth carefully looking after.

A correspondent writes us to express his satisfaction at the fact that hereafter the boilers in use at Coney Island are to be inspected, and that engineers there must pass an examination. He very truly says, that considering the large number of visitors there during the summer, a boiler explosion would be likely to be unusually disastrous. He thinks this will do away with some of the alleged engineers he saw there this summer.

Literary Notes.

NOTES ON THE CHEMISTRY OF IRON. By Magnus Troilus, E. M. New York: John Wiley & Sons, publishers.

In this work the author has given in plain language a description of such chemical methods of analysis of iron and steel as have demonstrated themselves to him to be of practical value. The description of processes is happily complete, making simple and plain many things that, to the uninitiated, have appeared mysterious. We believe the book will be well received.

QUESTIONS AND ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common-sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.

(306) E. C. S., Rochester, N. Y., will find directions for proportioning cone pulleys in AMERICAN MACHINIST of Oct. 15, 22, and Nov. 26, 1881, and Feb. 25, 1882.

(307) Q C. Boston, Mass., asks: What are the chief objections to the use of the link on locomotives? *A.*—That it does not give sufficient port opening for steam admission at short cut-offs; that the exhaust opens and closes too early, and that the lead varies. Most of the objections to the link are more fancied than real.

(308) R H Lexington, Ky., asks: Would a patented arrangement whereby small round iron and steel could be centered, chilled and reamed for turning twice as fast as is done at present, have any value, it being comparatively inexpensive? *A.*—It would, decidedly; but before you risk too much be sure that you acquaint yourself with how quickly such work is already done in the best modern shops.

(309) L. M., Nashua, N. H., writes: I am desirous of making some springs of hard brass wire, but winding the wire upon a mandrel I find upon releasing the end of the wire that the hole through the spring will be considerably larger than the mandrel which it is wound upon How can I make it lie close to the mandrel? *A.*—It is not necessary to try. Measure how much too large the hole is, then make a new arbor as much smaller than the one you have used.

(310) E. R. B., E'mira, N Y., asks: At what point should cut-off take place in a non-condensing engine, 80 pounds boiler pressure, for the most economical results in the use of steam? *A.*—It would depend, to some extent, upon a variety of conditions, from which it would be impossible to make exact calculations. even if they were all known. For practical purposes you will be safe to assume that with 80 pounds boiler pressure, cut-off should be at ¼-stroke.

(311) L. M., Baltimore, Md., asks: Can you recommend me to some book that will guide me as to the proper speed at which I should run work in a lathe for turning, boring, etc. *A.*—There is no book published that will be of any value whatever to you in this respect. Your judgment will tell you how fast you can profitably run your work; if it does not, you are not fit to run a lathe. Our advice is, that you place no reliance on anything you may find published in this respect, but make a book of your own, from your own practice.

(312) L. Y., Atlanta, Ga., writes: I have a disk of cast iron 13¼ inches diameter, 1¼ inch thick. This disk is turned perfectly true on the arbor on which it runs, and the arbor being true, I assume that it must be in perfect balance, especially as the disk is sound all over. Running at high speed it shakes. Can you suggest what the trouble is? *A.*—Your difficulty is in assuming that because the disk is turned all over it must be in perfect balance. If you will mount the arbor on knife edges you will probably find it out of balance, or you can probably mark the heavy side as it runs. The remedy will be to drill holes in the light side and plug with lead, unless there is no objection to holes, unplugged, on the heavy side. There may be hidden holes in the casting; or, if not, it is almost impossible to get a casting so homogeneous that when truly turned it will be in perfect balance.

(313) Subscriber, ———, asks: 1. Why is it in vertical blowing engines the steam valves are set for very late admission—as late as one-twelfth stroke? *A.*—In some instances the valves for blowing engines are set for late admission so as to more nearly equalize the work and resistance through the stroke. When the piston first starts there is but little resistance of air; this resistance increases rapidly as the air is compressed up toward delivery pressure. 2. Is it usual in single-cylinder engines, such as those of the steamship Hudson, to give the valves, both steam and exhaust the same lead as in compound engines? *A.*—There would not be very much difference. Lead is given in both cases, as found by experience to give the best results. Sometimes the compound engine may have the most lead; sometimes the simple engine. 3. Is there a paint used that will stand the heat of side pipes and nozzles? *A.*—The paint will not stand very long. Perhaps as good a paint as any for this purpose is made by pulverizing asphaltum and dissolving as much as possible in spirits of turpentine at a gentle heat.

(314) V. S., Gleneve? La., asks: 1. What is the diameter of a circle the circumference of which is 7.84 feet? Multiplying 7 84 by .31831 does not give it. *A.*—Multiplying 7 84 by .31831 gives the diameter 2.4955, which is practically correct. 2. How can I reduce tenths to eights? *A.*—Multiply by 8. Thus: 5×8=4; .4375 is equal to 4375×8=3½ eighths, equal to 7-16. 3. Is there a rule for finding the temperature of steam from the pressure? *A.*—The following rule is deduced from Nystrom's formula: Multiply the 6-root of the pressure by 200, and from this subtract 101, the remainder will be the temperature. The pressure is to be taken as absolute, that is, 14.7 pounds must be added to the pressure indicated by the steam gauge. To find the 6-root, find the square root of the cube root. 4. I wi h to wrap a wooden tube with wire 1-16" diameter. How can I tell how much wire it will take? *A.*—Find the circumference to the center of wire; in this case add 1-16" to diameter of tube. This will give you the length of wire required to go once around. You can easily calculate how many times you must go around. This will be correct enough for all practical purposes. Make a sketch of pulleys to as large a scale as practicable, and measure it. Mathematical calculation is too complicated for ordinary use.

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

T. M. Parker, Steel Stamps, Stencils, Hart'f'd, Ct.

J. Clayton, Air Compressors, Rock Drills. 43 Dey st, N Y

Edw. Sears, wood engraver, 48 Beekman st., N. Y.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass.

Patent attorney and expert. Machine designs and details. Wm. H. Weightman, 82 Astor House, N Y

Tack, Wire, and Shoe Nail Machinery; Wm. A. Sweetser, Brockton, Mass.

The Best Upright Hammers run by belt are made by W. P. Duncan & Co., Bellefonte, Pa.

R Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Pattern and Brand Letters. Vanderburgh, Wells & Co., cor. Fulton and Dutch sts., New York.

Selden Packing for stuffing box, with or without rubber core Randolph Brandt, 38 Cortlandt st., N. Y.

The latest Improved Tack and Match Machinery is made by White Machine Co., Waterbury, Conn.

Foot-Power Machinery for workshop use, sent on trial if desired. W. F. & Jno. Barnes, Rockford, Ill.

Lyman's Gear Chart. How to lay out gear teeth. Price, 50c. E. Lyman, C. E., New Haven, Conn.

Upright power hammers, unequaled for die work run at high speed. Williams, White & Co., Moline, Ill

Tack and Wire Nail Machinery, made by the Wilets Mfg. Co., Providence, R. I.

Improved Labor-Saving Upright Drills. 20 in. to 30 in. inclusive. Currier & Snyder, Worcester, Mass.

Engine Lathes, Hand Lathes, and other fine tools. Assortment large; prices low. Frasse & Co., 62 Chatham st., N. Y.

Files recut without drawing temper, about one-half usual prices; samples recut free; prices on application. The Acme Co, Collinsville, Conn.

The outline ("wax process") engravings shown in the AM. MACHINIST each week are made by Struthers, Servoss & Co., 24 to 34 New Chambers St., N. Y.

"Complete Practical Machinist," $2.50; "Mechanical Drawing Self-Taught;" $4. Books for workmen. Joshua Rose, Box 3306, New York City.

Kellam's Pressure Regulator—used in heating system of 11-story building, Madison ave., N. Y.,—saved, last season, $2,000 over previous season. Hine & Robertson, 12 Cortlandt street, New York.

Locomotive Engine Running and Management. By Angus Sinclair Gives full directions about handling and repairing locomotives; instructs how to design valve gear and set valves; Westinghouse air brake explained by aid of engravings. Price, $2. For sale by *National Car Builder*, 187 Dearborn st., Chicago, Ill.

Every young man who aspires to be either a mechanic, merchant, or manufacturer, owes it to himself that he become thoroughly familiar with the writings of Chordal. John Wiley & Sons, 15 Astor Place. N. Y., have issued a new and enlarged 12 mo edition of "Extracts from Chordal's Letters." Handsomely bound in cloth, with over 50 illustrations. Price, $2. Discount of 25 per cent. on orders for five or more copies.

MANUFACTURES.

Belfast, Me., is figuring on water-works.

A Water-Works Company has been incorporated at Chippewa Falls, Wis.

It is probable that water-works will be constructed at Mifford and Bennett, Nebraska.

A saw-mill is to be built at Boyd, Wis, with a capacity of 60,000 feet per day.

R. G. Devoe, Birmingham, Ala., will be manager of a new iron fencing and railing factory at that place.

The new Gibson cotton mill, Marysville, N. B., will soon commence the manufacture of cotton flannels.

A correspondent writing us from Western New York says: "I find all the manufacturers talk 'bet ter business.'"

Charlotte, Mich., contemplates using in her proposed water-works nine and one-half miles of pipe and 58 hydrants.

The Fitchburg, Mass, Worsted Company are putting up a three-story addition to their factory, 110×45 feet, and will employ more help.

Daniel Marvin, Henry P. Magill and others have incorporated the North Lacrosse Hosiery Company, North Lacrosse, Wis.; capital stock, $5,000.

The Elk Rapids Iron Company, Elk Rapids, Mich., recently filled an order from England for 206 tons of charcoal pig iron.

D. M. Parker and others are organizing a company for the manufacture of cotton seed oil and guanos at Conyers, Ga.

The Abeles Cash Indicator and Recorder Co., is the name of a new company organized to manufacture Abeles' cash controlling instruments.

Portland parties, including ex-postmaster Barker are endeavoring to form a stock company to operate Andrews' granite quarry in Biddeford, Me.

The Kensington Engine Works, of Philadelphia, write us: "We are very busy, and could not do more than we are doing at present."

The new Chicago, Burlington and Northern Railway, an offshoot of the C. B. and Q. R. R, is to use large cast-iron pipes for culverts instead of stone.

L. S. Starrett, Athol, Mass., manufacturer of machinists' small tools, writes us: "My business is very good, and am driven to keep up with orders."

Timothy Elliott, Biddeford, Me., has secured rooms, and is putting in machinery to manufacture a carriage-washer cutter on which he has secured patents.

The Edgerton Manufacturing Company, Edgerton, Ohio, has been incorporated to manufacture shovels, forks, broom-handles, etc. Capital stock, $15,000.

Queen & Co., Philadelphia, Pa., have issued single-sheet catalogues of their perfected drawing pen, India ink, and the Acme drawing papers furnished by them.

The W. G. & A. R. Morrison Company, Willimantic, Conn., is making large shipments of silk machinery, and reports business as being lively, with orders ahead.

The Russell-Miller Milling Company, lately incorporated at Valley City, Dak., with a capital of $100,000, will operate flouring mills at Valley City, Jamestown and Bismarck.

The ex-railroad magnate, Jay Cooke, owns a fine water-power on the St. Louis river, at Fond du Lac, Minn., and is reported as likely to build a large flouring mill there.

The Lookout Rolling Mill Co., Chattanooga, Tenn., has been organized by A. M Johnson, and others, with a capital stock of $10,000, for the manufacture of steel.

Messrs. Mason & Foristell are likely to locate their tobacco factory at Wright City, instead of Mexico, Mo., substantial inducements having been offered by the former place.

Smith & Cooley, Stafford Springs, Conn., who recently purchased the cotton warp mill owned by Edward Pinney, of that place, propose to fill the mill with machinery for the manufacture of shoddy.

Freeman & Loomis are putting machinery in a building in Exchange street, Syracuse, N. Y., for the manufacture of waterproof paper boxes and baskets. The works will be in operation in about a month.

The Riverside Iron Company, of Steubenville, Ohio, has contracted with the Brown Hoisting and Conveying Machine Company, of Cleveland, Ohio, for a furnace hoist plant for the new Steubenville, Ohio, furnace.

The Eames Vacuum Brake Co, 123 Oliver street, Boston, Mass., send us a handsomely-illustrated catalogue of railway train and driver brakes, and required attachments. The descriptions are very full and complete.

A stock company has been formed at Monongahela, Washington County, Pa., to sink test wells for natural gas or oil. Ten thousand dollars stock was subscribed, which amount will be raised to $20,000 if necessary.

Messrs. Gay & Warr, of Oneida, N. Y, are preparing to build a brewery on the corner of Madison and Sconondoa streets. It will be of brick, 60×40 feet. They hope to have it completed before cold weather sets in.

The New Bedford Manufacturing Co., at New Bedford, Mass., is negotiating for land on which to build a new mill of equal size with the present one, which runs 15,000 spindles in the manufacture of cotton yarn.

P. Pryibil, 461 to 467 W. 40th street, New York, has issued a new catalogue of machinery for working brass, ivory, horn, etc. It includes buffing, sawing, and polishing machinery, also metal-spinning and wood-turning lathes.

Daly & Co, will break ground for the erection of a worsted mill at Tenth and Rose streets, Chester, Pa., in a few days. It is proposed to have the mill in running order about December 1, when about 30 hands will be given employment.

The Hartford Tool Company, Hartford, Conn., manufacturers machinists' small tools, etc., write us: "Business has improved lately in our regular tools; we have orders from all parts of the country, especially from the South and from Mexico."

The Acme Machinery Co., bolt and nut machinery, Cleveland, Ohio, write us: "We are very busy at present, and have been so for quite a time. Are so full of orders that we must put all our small machinery and fitters on the second floor, to give us room on the first floor for erecting."

The Casco Iron Works property, at East Deering, Me., which has been idle for several years, has been purchased by M. T. Denham, of Gloucester, Mass., who is making extensive repairs upon the buildings and machinery, and intends to start up the works about November 1. The sale includes foundry, boarding house, lands, etc. The manufacture of anchors will constitute one of the new features of the business.

The committee of the village board of Hyde Park Ill., to whom was referred the bids for the new pumping machinery, reported last week in favor of accepting the bid made by the Holly Manufacturing Company. As that bid was the highest one made, the report created some hostility, and on its submission to the village board last Monday it was received and the committee discharged. This leaves the whole question open.—*The Sanitary News.*

The Kensington Engine Works, Ld., Philadelphia, have recently furnished Hoopes & Townsend with one of their 18" Buckeye automatics. This engine was designed especially to take the place of their 18"x36" throttling engine, and go on the same foundations, as they could not stop to tear out and rebuild. A heavy sub-base of box section was constructed, the bottom arranged to take the old foundation bolts, while the top had planed surfaces to suit the pedestal and cylinder feet on engine. The old engine was taken out and the new one erected under full load, within a week, the shop being run temporarily by another engine.

Railroad building in Tennessee is taking a spurt since the commission has been abolished. The directors of the Nashville, Chattanooga and St. Louis Railroad contemplate the extension of several important branches of the road. It is proposed to extend the Lebanon branch twenty miles to Carthage; the McMinnville branch, six miles to the Bonair coal fields; the Fayetteville branch, twenty-five miles, from Elora to Huntsville; and the Jasper branch, up the Sequatchee Valley. The extension of these lines will develop the resources of some of the best iron and coal counties in the State. Other lines are projected by New York and Pennsylvania capitalists, and surveys are now being made for new enterprises. The traffic over the proposed lines would amount to many thousand dollars annually, and accomplish great results in many ways.—*Railroad Record.*

Robert E. Masters, Beloit, Wis., writes us as follows: "Fairbanks, Morse & Co., of Chicago, have just finished putting in water works in the city of Beloit, Wis J. A. Kenley was superintendent of construction. The pump and boiler house is 35'×57', and is built of pressed brick. There are two compound duplex pumps of the Smith & Vaile, Dayton, Ohio, pattern, 18" and 12"×10"×10"; capacity 1,000,000 gallons each 24 hours. Two steel boilers, built by the Erie City Boiler and Machine Works, 54" in diameter and 15' long, 62-3" beaded flues in each. The well is 30' in diameter and 35' deep, contains 18' of water and will supply 3,500,000 galls. daily. The tower is octagonal, and is built entirely of stone. It is 36' outside diameter at the base, and 30' outside diameter at the top; the inside diameter is 21'; the whole length 60' high up to the tank The tank is 30' in diameter and 20' deep, and is built entirely of 3" cypress lumber. It will hold 100,000 gallons of water. The tower is built upon an eminence which places it considerably higher than any building in the city, and is situated 200 yards from the pumping rooms. The supply pipe from the pumps to the tank is 12" in diameter; 7¼ miles of pipe from 4" to 14" diameter have been laid 6' 6" below the surface of the ground throughout the principal part of the city, and 72 Matthews hydrants have been placed at convenient points. The tank and fixtures and all the castings used about the

tower and well were made by the Eclipse Wind-Engine Company of this city. There will be a regular pressure of 50 pounds per square inch for domestic purposes. In case of fire there is a valve between the pumping house and the reservoir which can be closed, and a direct pressure of 150 pounds given on the main leading into the city. Water will be let into the city about November 1st, at which time it has been decided to celebrate the event, and bid good-bye to the old hand fire-engines."

The Chicago, Burlington and Northern Railroad Company have secured 60 acres of land in and near Savanna, Ill., on the Mississippi river, and it is said they will locate shops there.

The Aroostook, Me., *Pioneer* says: "It seems strange to us that capitalists do not look over the water-power at West Houlton, with a view to the erection of a pulp mill at that point. There is probably no better location in the State for such an industry, the raw material growing there in abundance."

Machinists' Supplies and Iron.

NEW YORK, Oct. 22, 1885.

Reports of business improvements continue, and evidence accumulates that a solid basis of prosperity is being slowly reached. Buyers are cautious, but on the whole are placing orders more freely than three months ago. In the general commercial situation the signs are healthy.

Iron—American pig rules quiet but steady. Buyers do not appear inclined to lay in stock, but the sales for current use absorb a large part of the available supply. We quote No. 1 X Foundry, $18 to $18 50 for standard brands; No. 2 X Foundry, $16 to $16.50; Grey Forge, $14.00 to $15.50.

Scotch Pig—There has been no change in prices, and but few sales of small lots have been made. We quote Coltness, $19.50 to $20; Glengarnock, $18 50 to $19; Gartsherrie, $19 to $19.50; Summerlee, $19 to $19.50; Eglinton, $17.50 to $18; Langloan, $19.50; Dalmellington, $18 to $18.25.

Lead—Some sales have been made at 4.15c., but there is no activity in the market.

Copper—Prices are little lower than last week's quotations. Lake is offered at 10.90c., but 10.70c. is bid. In small lots Lake is held at 11c. to 11⅛c.; other brands 10¾c. to 10¾c.

Tin—Jobbing lots of Banca have sold at 20¾c.; Straits and Malacca, 20.60c. to 20 65c.

Spelter—Refined, 5c.

Antimony—Prices are slightly in favor of buyers. We quote Hallett's, 8.60c.; Cookson's, 9.60c.

WANTED

"Situation and Help" Advertisements, 30 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

Experienced draftsman wants position; good references. Address Y, AM. MACHINIST.

Situation as foreman of machine shop; good refences given. Address Buckeye, AM. MACHINIST.

Wanted—Situation as superintendent of iron foundry. Address Supt. Iron Foundry, AM. MACHINIST.

Wanted—Situation by a first-class pattern maker; 18 years' experience; Philadelphia preferred. Address A. B., AM. MACHINIST.

Experienced draftsman and machinist desires position as draftsman, foreman or assist. supt. Address Montague, AM. MACHINIST.

Wanted—A thoroughly practical foundryman to take charge of a foundry engaged upon railroad and general castings, in Western Penn. Address "Foundry," AM. MACHINIST.

Wanted—A leading position by a practical man as designer of time-saving machinery and methods; large experience on metal dies and tools. Address "Automatic," AM. MACHINIST.

Wanted—Situation by energetic graduate, C. E.; rapid and accurate draftsman; good mechanic; understands all kinds of machinery; excellent refer'ces. Address A, 183 Wood st., Wilkesbarre, Pa.

Wanted—By a firm in Canada, manufacturing agricultural machinery, a first-class practical machinist, as foreman of machine shop, who understands management of men and getting out work on piece-work system. Address, with references, stating age and salary expected, Room 12, Tribune Building, New York City.

MISCELLANEOUS WANTS

Advertisements will be inserted under this head at 25 cents per line, each insertion.

The Crescent Steel Tube Scraper is king. Crescent Mfg. Co., Cleveland, Ohio.

To make room for larger tool, will sell cheap, for cash, a planer 42"x42"x12', in good order. Address P. O. Box 2085, Bridgeport, Conn.

Light machinery of all kinds built at short notice. Good workmanship guaranteed. Pennington & Mills, 8 Dey st., Jersey City Heights, N. J.

Parties having a small foundry and machine shop to sell or rent, address, with particulars, BOX 12, AM. MACHINIST.

For Sale—Stock, tools and lease of small foundry near Philadelphia, in running order; only small capital required. Address Iron, AM. MACHINIST.

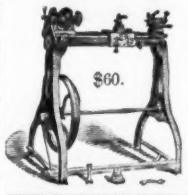
Patented steam-valve movement. The undersigned desires to communicate with parties willing to buy rights, or manufacture on royalty the above patent. Address Steam, AM. MACHINIST.

For Sale, very low—one new 12"×18" and three new 8"×12" girder frame, plain slide-valve engines; these engines are very strong framed, and machine work is first class. P. M. Sharples, West Chester, Pa.

CHANDLER & FARQUHAR,

177 & 179 Washington St.,

BOSTON, MASS.



TOOLS AND SUPPLIES

—FOR—

Machinists, Plumbers, Gas Fitters, Electricians, Model Makers, Roller Skate Makers, Amateurs, etc.

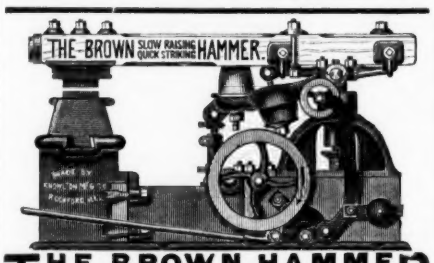
Send for Catalogue B.

BRADLEY'S UPRIGHT CUSHIONED HELVE HAMMER

Established 1832.

Combines all the best elements essential in a first-class Hammer. Has more good points, does more and better work and costs less for repairs than any other **Hammer** in the **World.**

BRADLEY & CO. Syracuse, N.Y.



THE BROWN HAMMER

STRIKES A BLOW WITH

DOUBLE THE VELOCITY That it Raises the Hammer.

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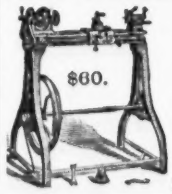

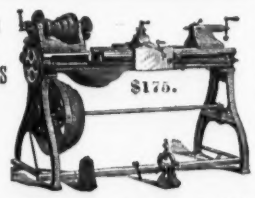

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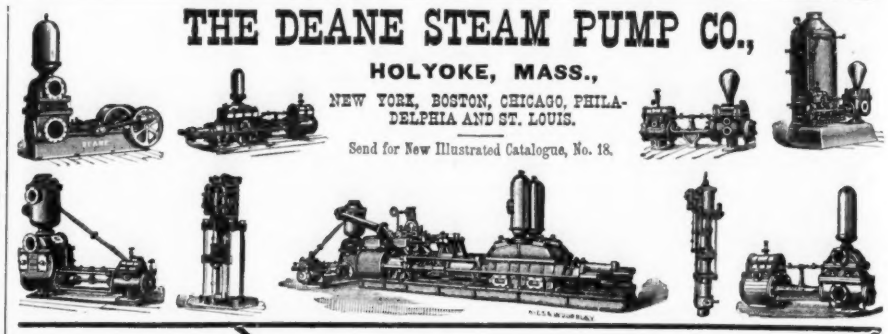

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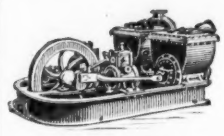

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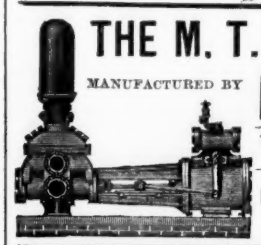

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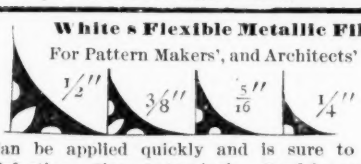

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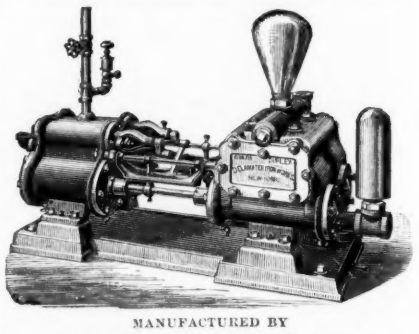

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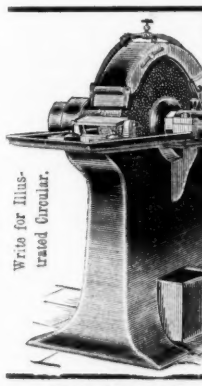

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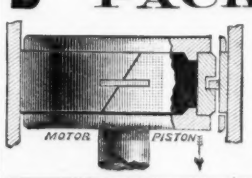

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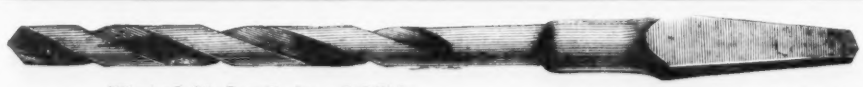

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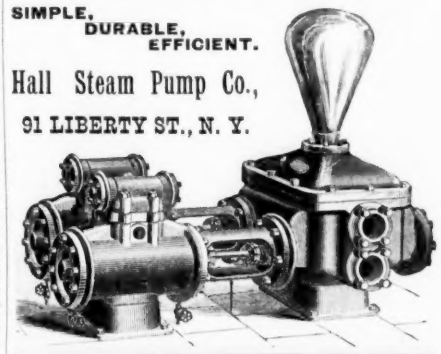

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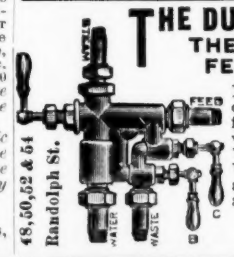

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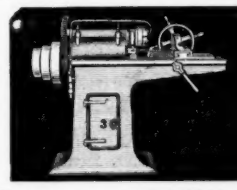

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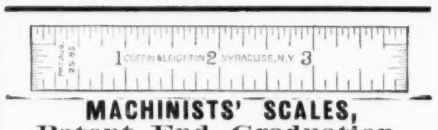

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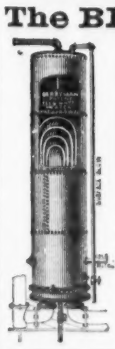

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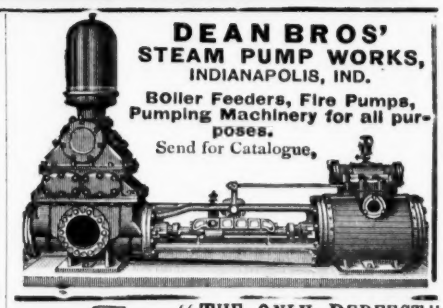

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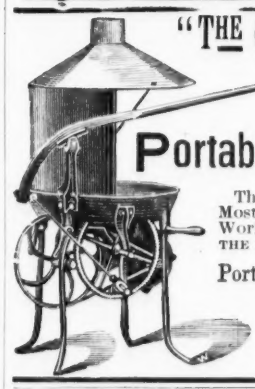

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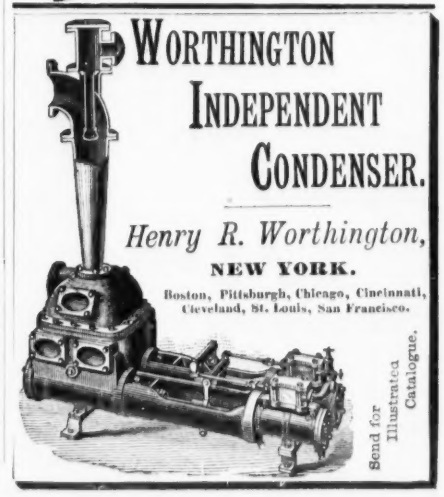

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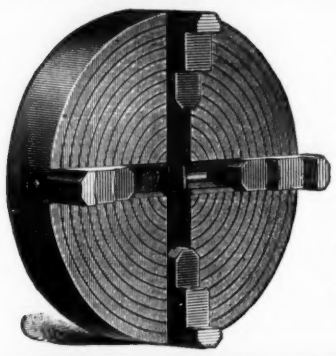

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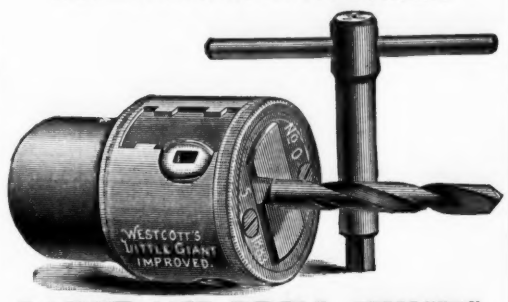

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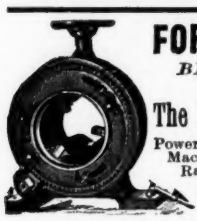

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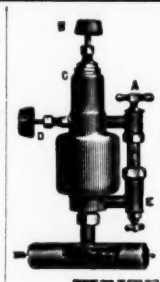

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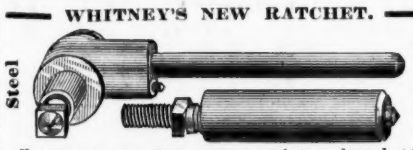

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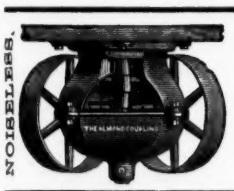

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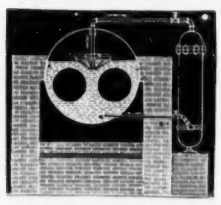

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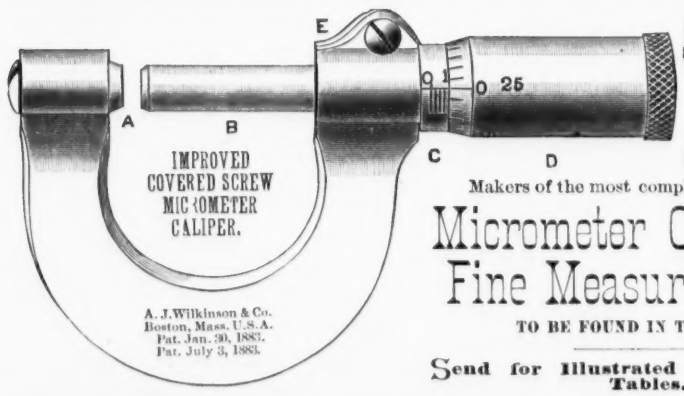

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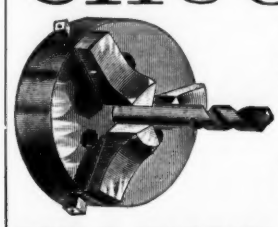

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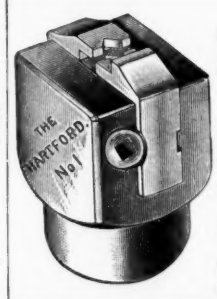

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NOTICE.

Week before last we published, under this heading, references to a small portion of the practical articles that have been specially prepared for the AMERICAN MACHINIST, and have appeared in our columns during the last few months. Last week we published an additional list. We append another list below. No other mechanical journal in this country has or ever has had such a collection of practical articles, by writers of well known ability, as are presented in these columns week by week. Every issue gives information that is taken up and applied in the shops and factories in various parts of the country. Copies containing these articles can be readily obtained by ordering of any newsdealer, or by writing to this office, at 5 cents per copy.

Wm. M. Barr.

Kaolin and Plaster of Paris as a Boiler Covering May 17, 1884

Another Explosion in a Pump Plunger. May 31 1884

Frank H. Ball.

Balancing the Reciprocating Parts of Steam Engines January 3, and February 21, 1885.

Frank H. Richards.

Something About Chucks. January 12, 1884

Running a Lathe. January 12; February 23; March 1; May 3, 17, 1884

Grinding and Using Cutting Tools. May 2, 1885

Grinding Tools Again. June 6, 1885

Screw Cutting on the Engine Lathe. June 13, 1885

Pay Days and Early Closing. August 15, 1885.

Twist Drills and Twisted Arithmetic. July 25, 1885.

George Escol Sellers.

Early Engineering Reminiscences. June 7, 14; July 12; August 9, 23; October 11, 25; November 1; December 13, 20, 1884. February 28 March 14; April 11, August 22, 1885

John W. Nystrom.

Inertia Diagram. Dec. 27, 1884

Inertia. Aug. 30, 1884

George Marshall.

The Result of Imperfect Setting of Horizontal Tubular Boilers. May 24, 1884.

Form and Material of Boilers. June 14, 1884

Agricultural Boilers. September 27, 1884

Boiler Chimneys Considered from an Economical Standpoint. August 16, 1884

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Use of Mild Steel in Boiler Construction. March 8, 15, 1884

Safe and Unsafe Methods of Boiler-Making. Jan 12, 1884

Boiler Braces. May 3, 1884

Boiler Repairing. May 10, 1884

Objections to Boilers of the Locomotive Type April 5, 1884

The Care of Boilers. January 26, 1884

English *versus* American Boilers. July 19, 1884

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Fred. J. Miller.

Universal and Combination Lathe Chucks. May 24, 1884

Making Cutters for Involute Gear Teeth. February 16, 1884

Milling Machines, Tools and Fixtures. September 20, 1884

Pitch of Milling Cutter Teeth. October 4, 1884

L. C. Jewett.

Draft and Finish of Patterns. May 31, 1884.

Making 18" Face Pulley from a 12" Pattern. November 15, 1884

Thos. D. West.

Sound Castings. December 6, 1884

Small Castings. March 15 1884

Momentum and Rules for Weighting Down Copes. August 2, and July 26, 1884

Green Sand Cores. January 12, 1884

Foundry Cranes. August 23, 30, and September 6, 1884

Oddity and Science in the Construction of Cupolas . May 10, 1884

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Sweeping Grooved Cone Drums. April 19, 1884

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Foundry Plant. June 28, 1884

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The Mould Board. March 15, 1884

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How to Strike Up a Propeller Wheel. March 15, 1884

S. W. Goodyear.

Personal Recollections. January 12, February 9, March 15, 1884; July 18, 1885

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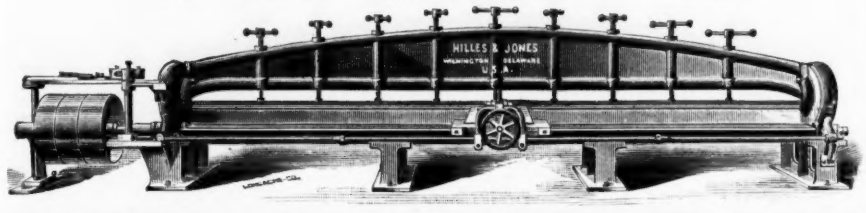

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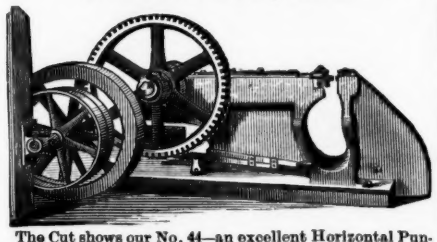

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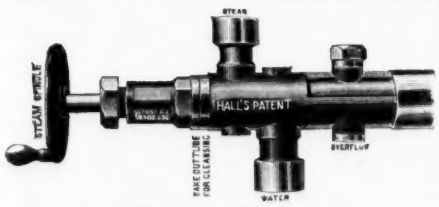

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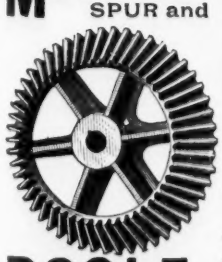

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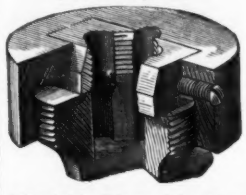

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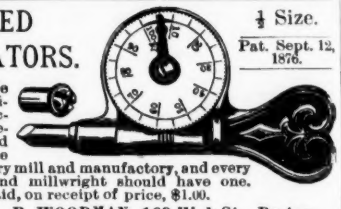

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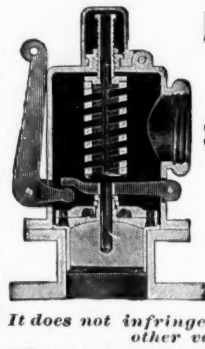

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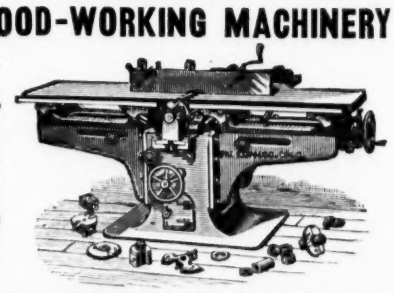

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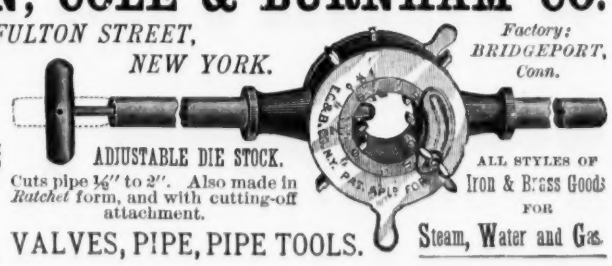

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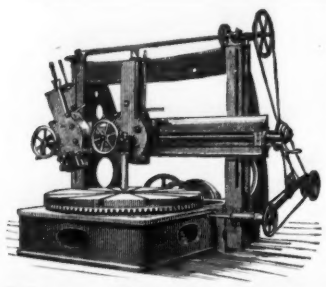

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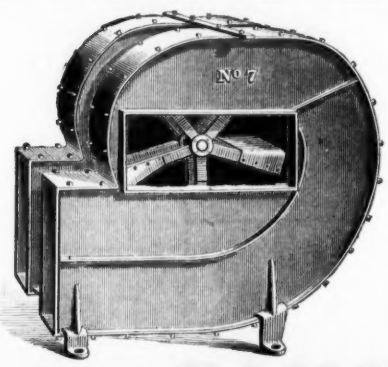

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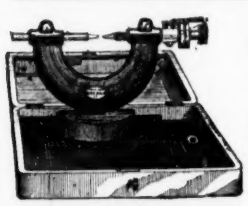

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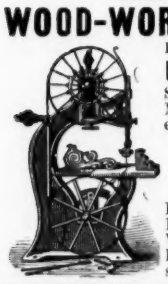

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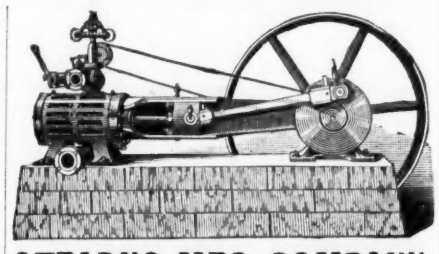

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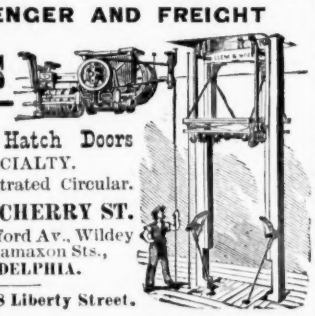

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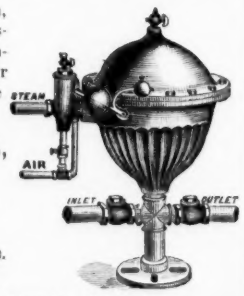

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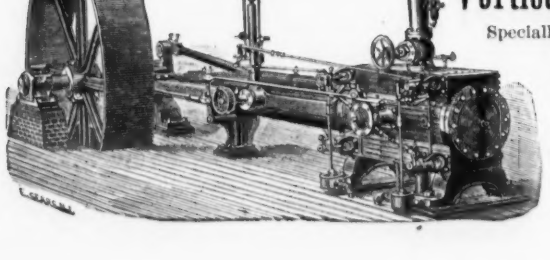

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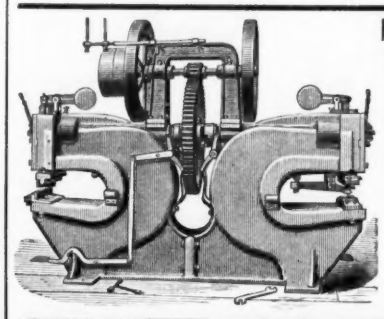

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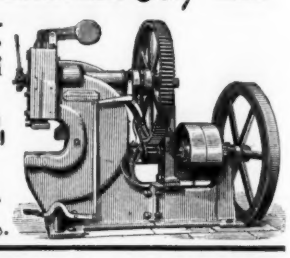

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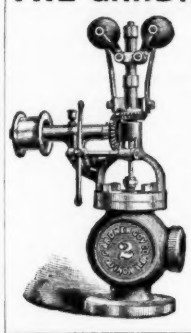

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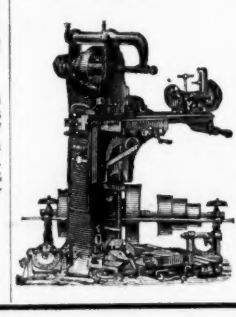

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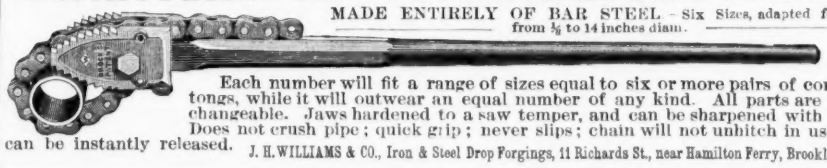

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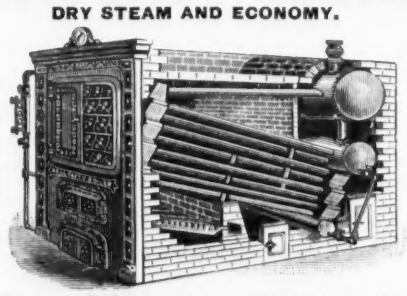

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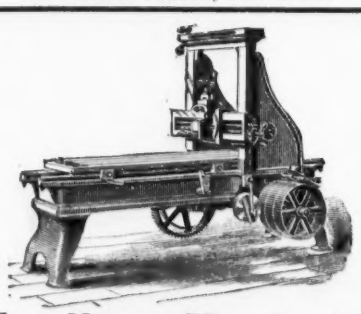

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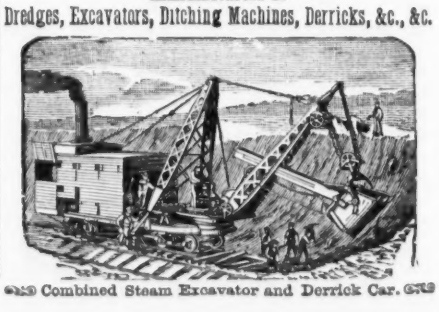

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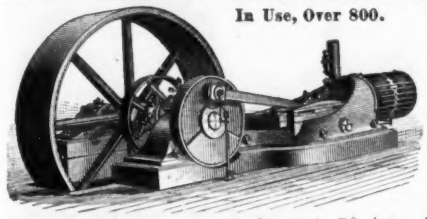

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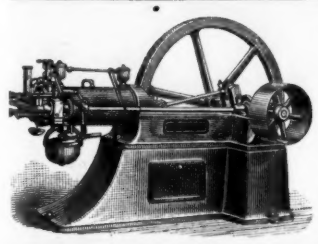

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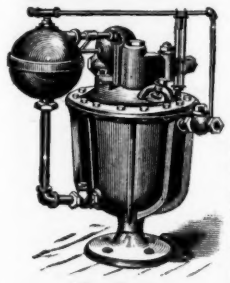

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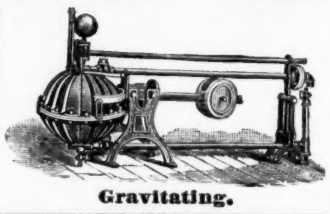

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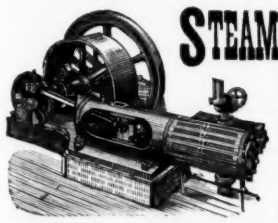

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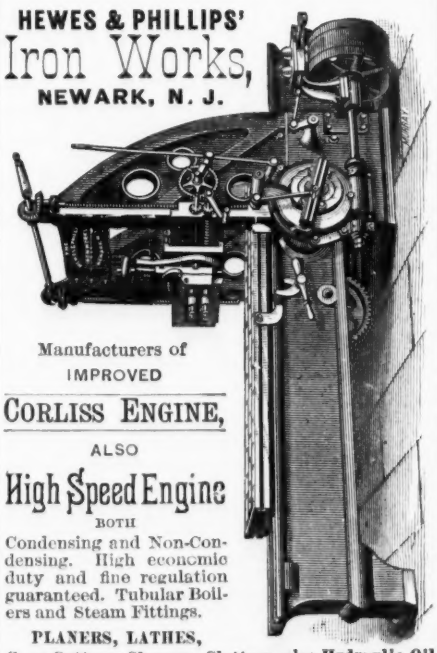

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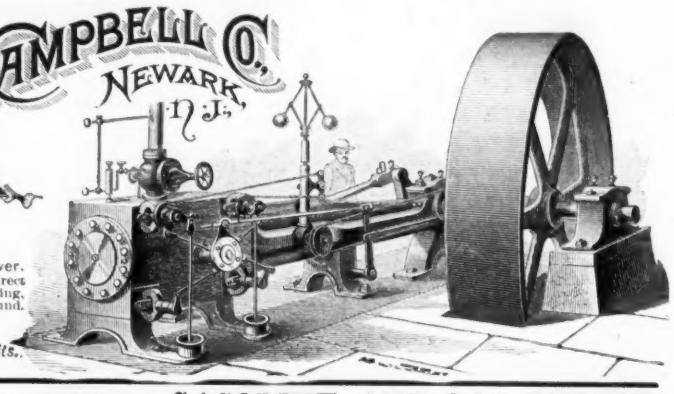

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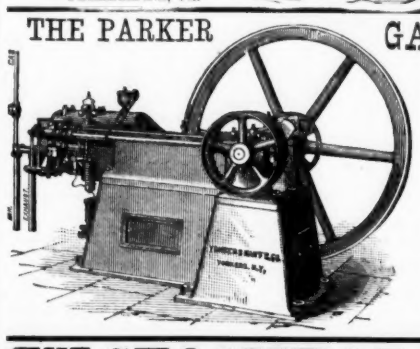

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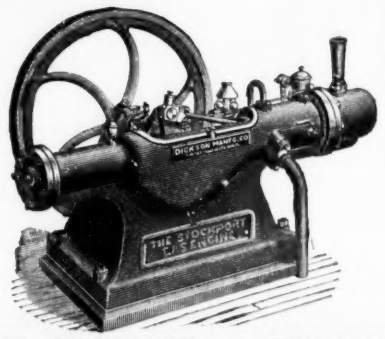

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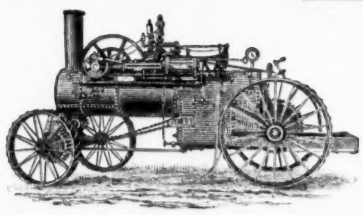

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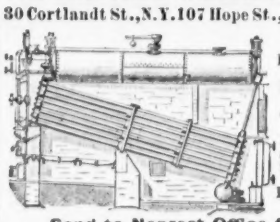

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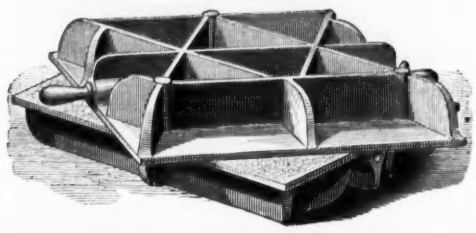

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4½ in. x 6 in.	9 in. x 9 in.	12 in. x 12 in.	16 in. x 16 in.
6 in. x 6 in.	9 in. x 14 in.	12 in. x 18 in.	18 in. x 18 in.
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6½ in. x 18 in.	10 in. x 30 in.	14 in. x 18 in.	24 in. x 24 in.

36 in. x 66 in.

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The manufacture of pulleys comprises quite a large part of our business, and we looked over the field considerably before purchasing of you, and this, with two years' experience, enables us to say, we think them **THE BEST PULLEY MACHINES** in the market.

Very truly yours, **W. McGREGOR & CO**

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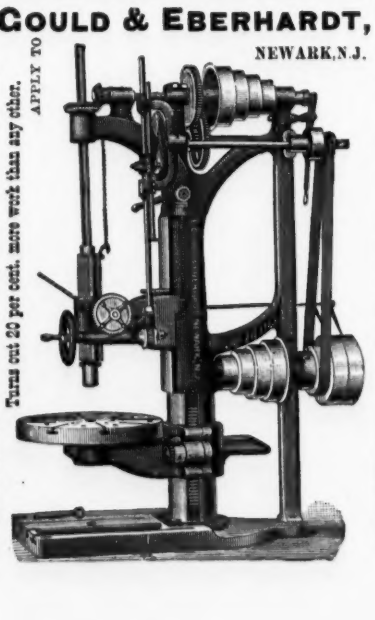

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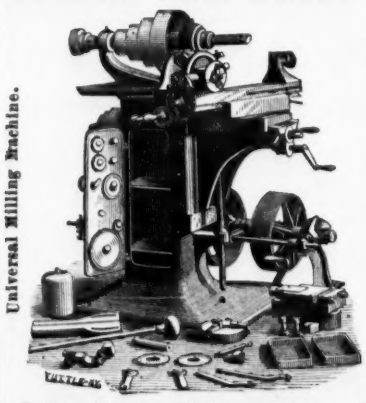

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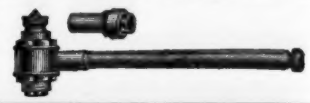

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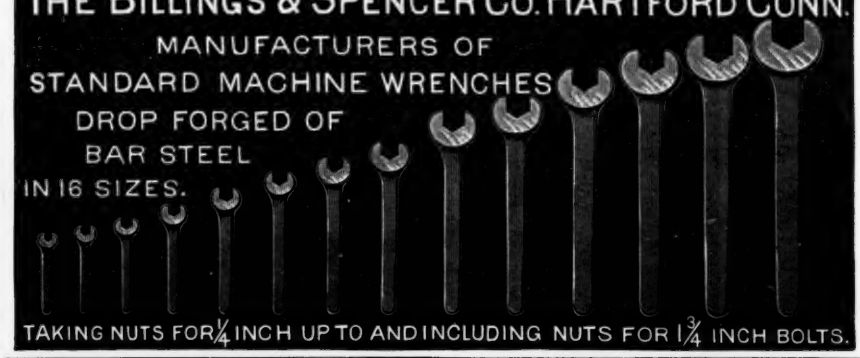

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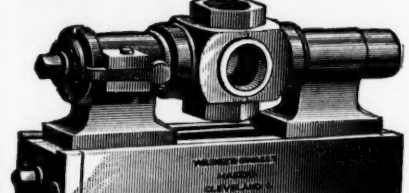

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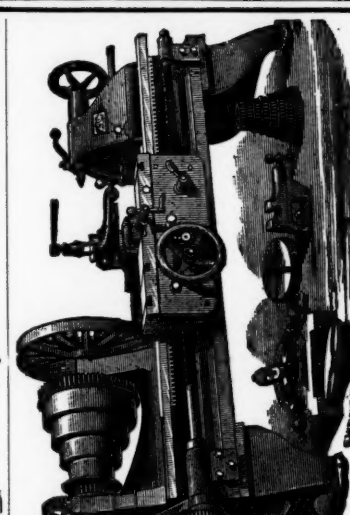

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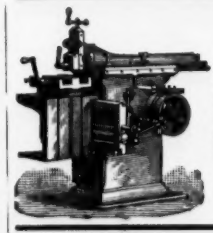

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